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For related information see also *Astronautics*.

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For related information see also *34 Fluid Mechanics and Heat Transfer*.

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Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer*

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Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

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Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

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07 AIRCRAFT PROPULSION AND POWER 3062

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

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18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3066

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Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 3201
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 3201
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 3201

89 ASTRONOMY N.A.
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 3201
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 3203
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 3203
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 3209
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

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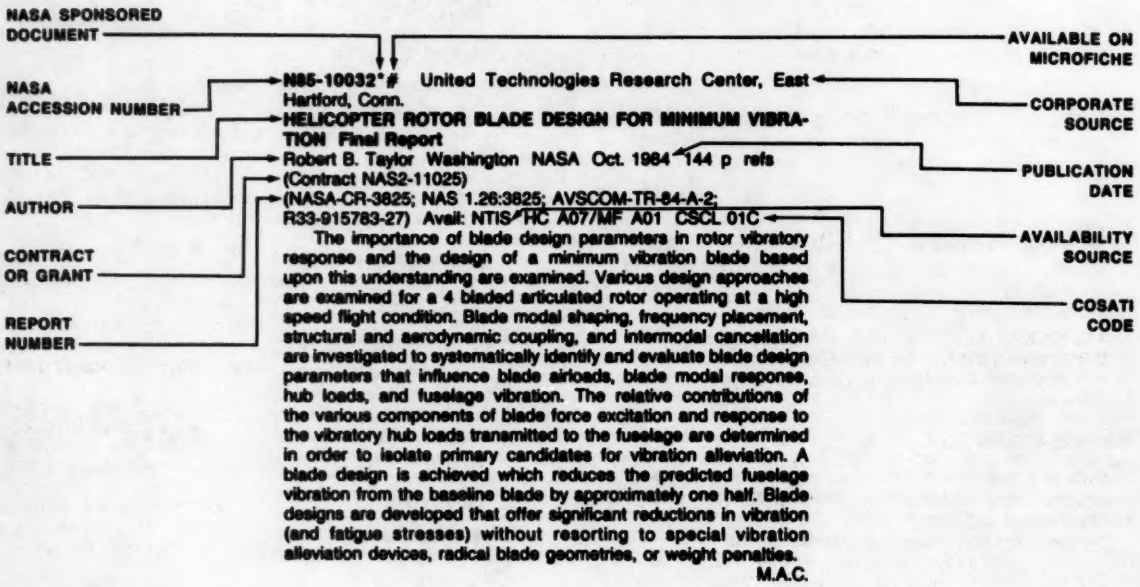
TYPICAL CITATION AND ABSTRACT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N85-10032*# United Technologies Research Center, East Hartford, Conn.
HELICOPTER ROTOR BLADE DESIGN FOR MINIMUM VIBRATION Final Report
Robert B. Taylor Washington NASA Oct. 1984 144 p refs
(Contract NAS2-11025)
(NASA-CR-3825; NAS 1.26:3825; AVSCOM-TR-84-A-2; R33-915783-27) Avail: NTIS HC A07/MF A01 CSCL 01C
The importance of blade design parameters in rotor vibratory response and the design of a minimum vibration blade based upon this understanding are examined. Various design approaches are examined for a 4 bladed articulated rotor operating at a high speed flight condition. Blade modal shaping, frequency placement, structural and aerodynamic coupling, and intermodal cancellation are investigated to systematically identify and evaluate blade design parameters that influence blade airloads, blade modal response, hub loads, and fuselage vibration. The relative contributions of the various components of blade force excitation and response to the vibratory hub loads transmitted to the fuselage are determined in order to isolate primary candidates for vibration alleviation. A blade design is achieved which reduces the predicted fuselage vibration from the baseline blade by approximately one half. Blade designs are developed that offer significant reductions in vibration (and fatigue stresses) without resorting to special vibration alleviation devices, radical blade geometries, or weight penalties.
M.A.C.

VOLUME 23 NUMBER 18 / SEPTEMBER 23, 1985

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N85-28912*# McLean (F. Edward), Yorktown, Va.
SUPERSONIC CRUISE TECHNOLOGY
F. Edward McLean Feb. 1985 194 p refs Original contains color illustrations
(Contract NASw-3531)
(NASA-SP-4720; NAS 1.21:4720; LC-83-26912) Avail: NTIS HC A09/MF A01; SOD HC $6.50 as 033-000-00944-5 CSCL 01B

The history and status of supersonic cruise research is covered. The early research efforts of the National Advisory Committee for Aeronautics and efforts during the B-70 and SST phase are included. Technological progress made during the NASA Supersonic Cruise Research and Variable Cycle Engine programs are presented. While emphasis is on NASA's contributions to supersonic cruise research in the U.S., also noted are developments in England, France, and Russia. Written in nontechnical language, this book presents the most critical technology issues and research findings. Author

N85-28913# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
HELICOPTER AEROMECHANICS
Loughton, England Apr. 1985 329 p refs Lectures held in Brunswick, 2-3 May 1985, in Rome, 6-7 May 1985, and in St. Louis, 21-22 May 1985
(AGARD-LS-139; ISBN-92-835-1499-8) Avail: NTIS HC A15/MF A01

A variety of information relevant to helicopters is presented. Topics range from actual aerodynamic studies to computerized simulation as employed in flight simulators. For individual titles, see N85-28914 through N85-28920.

N85-28914# Technische Univ., Brunswick (West Germany). Inst. fuer Flugmechanik.
HELICOPTER AEROMECHANICS: INTRODUCTION AND HISTORICAL REVIEW c05
G. Reichert *In* AGARD Helicopter Aeromech. Apr. 1985 23 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

Although the current generation of civil and military helicopters have greatly improved upon the previous generations, rotorcraft technology still has the potential for decided improvements. As high-payoff technologies aeromechanics (aerodynamics/dynamics), structures/materials, avionics/flight controls, and engine drive system technology can be identified, of which aeromechanics will be discussed in more detail. The general role of aeromechanics in military and civilian applications to rotary wing aircraft will be summarized and an overview of the state of the art will be given. In addition to direct performance improvements, there is great opportunity to improve the operating characteristics to a degree that the full performance characteristics inherent in the designs may be realized. Some current systems fail in the utilization of their full performance as a result of dynamical limitations or high vibrational levels. G.L.C.

N85-28915# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A SURVEY OF RECENT DEVELOPMENT IN HELICOPTER AERODYNAMICS c05
J. J. Philippe, P. Roesch, A. M. Dequin, and A. Cler *In* AGARD Helicopter Aeromech. Apr. 1985 40 p refs Prepared in cooperation with Societe Nationale Industrielle Aerospatiale, Marignane, France (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

Various aspects of helicopter aerodynamics are addressed. The aerodynamics of isolated rotors and fuselages as well as some topics in interactional aerodynamics are dealt with. G.L.C.

N85-28916# Loughborough Univ. of Technology (England).
ROTORCRAFT NOISE c71
J. B. Ollerhead *In* AGARD Helicopter Aeromech. Apr. 1985 38 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

The mechanisms of rotor noise generation are reviewed including methods for noise prediction and low noise design. Attention is focussed on the subjective effects of helicopter noise and the consequent requirements for statutory noise regulation. The economic and operational implications are discussed. G.L.C.

N85-28917*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RECENT DEVELOPMENTS IN THE DYNAMICS OF ADVANCED ROTOR SYSTEMS c05
Wayne Johnson *In* AGARD Helicopter Aeromech. Apr. 1985 51 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01 CSCL 01C

The problems that have been encountered in the dynamics of advanced rotor systems are described. The methods for analyzing these problems are discussed, as are past solutions of the problems. To begin, the basic dynamic problems of rotors are discussed: aeroelastic stability, rotor and airframe loads, and aircraft vibration. Next, advanced topics that are the subject of current research are described: vibration control, dynamic inflow, finite element analyses, and composite materials. Finally, the dynamics of various rotorcraft configurations are considered: hingeless rotors, bearingless rotors, rotors with circulation control, coupled rotor/engine dynamics, articulated rotors, and tilting proprotor aircraft. G.L.C.

N85-28918# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
MISSION REQUIREMENTS AND HANDLING QUALITIES c08
B. L. Gmelin and H.-J. Pausder *In* AGARD Helicopter Aeromech. Apr. 1985 37 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

With the appearance of new missions for helicopters and with the development of a new generation of rotary-wing aircraft it has become obvious at the latest that future activities in the field of handling qualities must include the mission characteristics as well as the influences of the different subsystems implemented in the helicopter system. Therefore, mission analyses and consideration of system elements influencing mission performance are the basis for this work. The missions under consideration emphasize military missions but refer to civil missions, too. The system elements influencing mission performance include the basic helicopter, the pilot, the information system, the control system, interfaces, etc. G.L.C.

N85-28919# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THE ROLE OF SIMULATION **c09**
H. Huber and P. Krauspe *In* AGARD Helicopter Aeromech. Apr. 1985 35 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

The development of helicopter flight simulation has undoubtedly made considerable progress in the past decade. Due to the helicopter specific flight regime, which is essentially characterized by low altitude flying (NOE), low to moderate speeds, and distinct stability and control behavior, the simulation of rotorcraft sets high standards to the simulation quality. An overview about the various simulation techniques and their specific application during research and development work is presented. First, the details and capabilities of the round-based simulation are discussed. Stringent requirements for real-time simulation result in the use of comprehensive math models, representing the aerodynamic and dynamic complexities of rotary-wing aircraft. In addition, great effort has to be made to simulate the environmental scenario, such as visual and motional cues. Advances are especially made on the field of generating and displaying visual imagery. The technique of computer generated images (CGI) and the progress achieved, e.g., in the field-of-view and resolution, is demonstrated. G.L.C.

N85-28920# Royal Aircraft Establishment, Bedford (England). Helicopter Aeromechanics Section.
FLIGHT TESTING FOR PERFORMANCE AND FLYING QUALITIES **c05**
G. D. Padfield *In* AGARD Helicopter Aeromech. Apr. 1985 51 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

A systematic review of flight test techniques and test data interpretation methods for helicopter performance and flying qualities is presented. The distinction is drawn between quasi-steady and dynamic testing and within these categories both clinical and role-related techniques are discussed. Performance topics covered include steady state performance in hover and forward flight, flight envelope boundaries, take-off and landing performance, and helicopter agility. Flying qualities topics begin with a treatment of static stability tests and progress to dynamic stability, control response, system identification and role-related evaluation techniques. Testing appropriate to certification and development phases and research activities are addressed. The exploratory nature of flight testing is evident throughout this work and safety aspects are emphasized when required. Results from recent and past test programs are used to illustrate the forms in which flight data can be presented, and data reduction and analysis methods established and under development are reviewed. Author

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N85-28921*# Iowa State Univ. of Science and Technology, Ames. Dept. of Aerospace Engineering.
NUMERICAL COMPUTATION OF SPACE SHUTTLE ORBITER FLOW FIELD Semiannual Status Report, 1 Apr. - 30 Sep. 1984
John C. Tannehill 30 Sep. 1984 5 p refs
(NASA-CR-175912; NAS 1.26:175912) Avail: NTIS HC A02/MF A01 CSCL 01A

The complete inviscid viscous real gas flow around the Space Shuttle Orbiter was computed. Real gas effects are important in predicting the reentry environment around the Orbiter because the high temperatures within the shock layer cause the air to dissociate and ionize, thus invalidating the perfect gas assumption. It is shown that real gas effects has a significant influence on the Orbiter aerodynamics. The approach utilizes a time dependent Navier-Stokes code to compute the subsonic nose portion of the flow field. This nose solution provides the initial conditions for the parabolized Navier-Stokes (PNS) code. E.A.K.

N85-28922*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMBINED RIBLET AND LEBU DRAG REDUCTION SYSTEM Patent Application
Michael J. Walsh, Jerry N. Hefner, and John B. Anders, inventors (to NASA) Filed 27 Dec. 1984 17 p
(NASA-Case-LAR-13286-1; NAS 1.71:LAR-13286-1; US-Patent-Appl-SN-686959) Avail: NTIS HC A02/MF A01 CSCL 01A

The invention is a system of flow control devices which result in reduced skin friction on aerodynamic and hydrodynamic surfaces. The devices cause a breakup of large-scale disturbances in the boundary layer of the flow field. The riblet device acts to reduce disturbances near the boundary layer wall by the use of longitudinal striations forming vee-shaped grooves. These grooves are dimensional on the order of the wall vortices and turbulent burst dimensions. The large eddy breakup device is a small strip or airfoil which is suspended in the upper region of the boundary layer. Various physical mechanisms cause a disruption of the large scale vortices. The combination of the devices of this invention result in a substantial reduction in skin friction drag. NASA

N85-28923*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WIND-TUNNEL EVALUATION OF A 21-PERCENT-SCALE POWERED MODEL OF A PROTOTYPE ADVANCED SCOUT HELICOPTER
Arthur E. Phelps, III and John D. Berry Washington NASA, Washington Jun. 1985 76 p refs Prepared in cooperation with Army Aviation Systems Command, St. Louis
(DA Proj. 1L1-62209-AH76)
(NASA-TP-2420; L-15895; NAS 1.60:2420; AVSCOM-TR-85-B-2)
Avail: NTIS HC A04/MF A01 CSCL 01A

An exploratory wind tunnel investigation of a 21 percent scale powered model of a prototype advanced scout helicopter was conducted in the Langley 4 by 7 Meter Tunnel. The investigation was conducted to define the overall aerodynamic characteristics of the Army Helicopter Improvement Program (AHIP), to determine the effects of the rotor on the aerodynamic characteristics and to evaluate the effect of a mast mounted sight on the aircraft stability characteristics. Tests covered a range of thrust coefficients, advance ratios, angles of attack and angles of sideslip and were run for both rotor on and rotor off configurations. Results of the investigation showed that the prototype configuration was longitudinally unstable with angle of attack for all configurations tested. The instability was due to unfavorable interference effects between the horizontal tail and the wake shed from the engine pylon and rotor hub, which caused a loss of horizontal tail effectiveness. The addition of the mast mounted sight had little effect on the stability of the model, but it caused an alteration in the rotor lift distribution that resulted in substantial interference drag for the sight. Author

N85-28924*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STATIC INVESTIGATION OF SEVERAL YAW VECTORING CONCEPTS ON NONAXISYMMETRIC NOZZLES
Mary L. Mason and Bobby L. Berrier Jun. 1985 219 p refs
(NASA-TP-2432; L-15890; NAS 1.60:2432) Avail: NTIS HC A10/MF A01 CSCL 01A

A test has been conducted in the static test facility of the Langley 16-Foot Transonic Tunnel to determine the flow-turning capability and the effects on nozzle internal performance of several yaw vectoring concepts. Nonaxisymmetric convergent-divergent nozzles with throat areas simulating dry and afterburning power settings and single expansion ramp nozzles with a throat area simulating a dry power setting were modified for yaw thrust vectoring. Forward-thrust and pitch-vectored nozzle configurations were tested with each yaw vectoring concept. Four basic yaw vectoring concepts were investigated on the nonaxisymmetric convergent-divergent nozzles: (1) translating sidewall; (2) downstream (of throat) flaps; (3) upstream (of throat) port/flap; and (4) powered rudder. Selected combinations of the rudder with downstream flaps or upstream port/flap were also tested. A single yaw vectoring concept, post-exit flaps, was investigated on the single expansion ramp nozzles. All testing was conducted at static (no external flow) conditions and nozzle pressure ratios varied from 2.0 up to 10.0. Author

N85-28925# National Aerospace Lab., Tokyo (Japan).
A METHOD OF DETERMINING THE SUCTION VELOCITY FOR LAMINAR FLOW CONTROL OF TWO-DIMENSIONAL AIRFOIL IN INCOMPRESSIBLE FLOW
Yoji Ishida 1984 23 p refs In JAPANESE; ENGLISH summary
(NAL-TR-845; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

A design method for laminar flow control of two-dimensional airfoils in incompressible flows is described. The method can be used for determining the suction velocity required to keep the boundary layer on an airfoil surface laminar to a given velocity required to keep the boundary layer on an airfoil surface laminar to a given chordwise distance under given design conditions. The design method consists of two parts. The first deals with the direct problem, i.e., the calculation of the boundary layer characteristics for any given suction velocity by a new integral method and the application of Michel's criterion of transition point to determine if the transition occurs or not. The second part deals with the inverse problem, i.e., the calculation of the suction velocity for any given R sub theta the Reynolds number based on the momentum thickness, which satisfies Michel's criterion. The results of the second part are used as initial input data of the required suction velocity in the first part. The method has been applied to two airfoils, NASA GA(W)-1 and NACA 64A010, and good results have been obtained. Author

N85-28926# Vrije Universiteit, Brussels (Belgium). Dept. of Fluid Mechanics.
TURBULENCE STRUCTURE IN THE BOUNDARY LAYERS OF AN OSCILLATING AIRFOIL Final Technical Report, Jan. - Dec. 1983
J. de Ruyck and C. Hirsch Dec. 1983 91 p
(Contract DAJA45-83-C-0021; DA Proj. 1T1-61102-BH-57)
(AD-A153631; VUB-STR-14) Avail: NTIS HC A05/MF A01 CSCL 20/4

The main objective of this work is to provide experimental information about velocity fields and turbulence structures in unsteady flows. A NACA 0012 airfoil oscillates around an axis at 25% chord distance from the leading edge, with a sinusoidal motion. Instantaneous distributions of velocity as well as all non-zero Reynolds stresses are determined in the profile boundary layers. Measurements are performed at various incidences, from non-stalled to deep stalled flow conditions. The reduced frequency is 0.3 at a chord Reynolds number of 300,000. A slanted rotating hot wire is used and the angular calibration characteristics of the wire are applied in order to detect and measure reversed flows. Instantaneous detailed flow and turbulence patterns of the periodic separation vortex are presented and discussed. These patterns are obtained from traverses at 8 chordwise positions along the suction side of the blade. GRA

N85-28927# Air Force Armament Lab., Eglin AFB, Fla.
SUBSONIC AND TRANSONIC AERODYNAMICS OF A WRAP-AROUND FIN CONFIGURATION
R. H. White, R. S. Buff, W. H. Hathaway, and G. L. Winchenbach 15 Jan. 1985 12 p
(AD-A153646; AFATL-TR-85-22) Avail: NTIS HC A02/MF A01 CSCL 20/4

Subsonic and transonic aerodynamic data for a wraparound fin configuration are presented. Free-flight aeroballistic tests to obtain these data were conducted at atmospheric pressure and over a Mach number range of 0.6 to 1.35. The aerodynamic coefficients and derivatives presented in this paper were extracted from the position-attitude-time histories of the experimentally measured trajectories using nonlinear numerical integration data reduction routines. Results of this analysis indicate that a dynamic instability exists above Mach 1.0 and is related to an out-of-plane side moment which is dependent of the pitch angle. The stability boundaries associated with this side moment are mapped. Designers should consider this moment whenever wraparound fins are used. GRA

N85-28928# Analytical Methods, Inc., Redmond, Wash.
A STUDY OF AERODYNAMIC CONTROL IN STALLED FLIGHT LEADING-EDGE VORTEX FORMATION ANALYSIS Final Report, Dec. 1981 - Aug. 1984
James K. Nathman Wright-Patterson AFB, Ohio AFWAL Feb. 1985 69 p refs
(Contract F33615-81-C-3626)
(AD-A153758; AFWAL-TR-84-3090) Avail: NTIS HC A04/MF A01 CSCL 20/4

This report describes the theory and application of VORSEP, a wake preprocessor for panel methods that use an iterative procedure to determine the position of strongly interacting vortex sheets. The estimation of the wake geometry is based on slender body theory with separation. An unsteady, two-dimensional airfoil program was automated with the addition of routines to interpolate cross-sectional geometry from arbitrary three-dimensional bodies, generate multi-core wakes and synthesize a three-dimensional wake structure. Leading-edge wakes for a delta, straked wing and double delta are constructed and used in VSAERO, a three-dimensional panel method. The wake structures compare reasonably well to experimentally observed vortex core positions, while calculated pressures on the wings with the estimated wakes compare well near the nose but less well near the trailing edge. GRA

N85-28929# Naval Postgraduate School, Monterey, Calif.
A COMPUTATIONAL METHOD FOR WINGS OF ARBITRARY PLANFORM M.S. Thesis
C. S. Jones Dec. 1984 66 p
(AD-A153788) Avail: NTIS HC A04/MF A01 CSCL 20/4

The computational method developed in this thesis permits the calculation of the aerodynamic performance of a wing of arbitrary planform. Both basic and additional lift are analyzed. This treatise is restricted to thin wings in steady, inviscid, incompressible flow. The method uses a grid system of control points over the wing semi-span. The circulation over the wing is considered variable with discrete values at the specified grid points. Finite difference equations are used to determine these discrete values. Control point indeterminacies are evaluated analytically. Matrix inversion is required for solution by the method presented. A brief summary of the principal computational relations is included. No numerical results are yet available but are expected during the next phase of this research. GRA

N85-28930# Analytical Methods, Inc., Redmond, Wash.
A STUDY OF AERODYNAMIC CONTROL IN STALLED FLIGHT LONG LAMINAR SEPARATION BUBBLE ANALYSIS Final Report, Dec. 1981 - Aug. 1984
Frank A. Dvorak and D. H. Choi Wright-Patterson AFB, Ohio

AFWAL Feb. 1985 35 p refs
(Contract F33615-81-C-3626)
(AD-A153850; AFWAL-TR-84-3091) Avail: NTIS HC A03/MF A01 CSCL 20/4

This report describes an analysis method for laminar separation bubbles (long or short) on two-dimensional airfoil sections at incidence. A viscous/potential flow iterative procedure was chosen due to its simple and efficient nature. The boundary layer procedure is a finite-difference method, sometimes referred to as the Bosx Scheme, and uses the Cebeci-Smith two-layer, eddy viscosity model for turbulence closure. The potential flow is calculated in such a way that it gives constant pressure along the surface inside the bubble, The coupled calculation procedure has been applied to the NACA 64A006 airfoil and satisfactory results have been obtained. GRA

N85-28931# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
POST-STALL WIND TUNNEL DATA FOR NACA 44XX SERIES AIRFOIL SECTIONS
C. Ostowari and D. Naik Jan. 1985 179 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002948; SERI/STR-217-2559) Avail: NTIS HC A09/MF A01

Unlike aircraft, a wind turbine's angle of attack range extends deep into stall where the three dimensional performance characteristics of airfoils are not generally known. Peak power predictions upon which wind turbine components are sized depend on a good understanding of a blade's post stall characteristics. The purpose of this wind tunnel study is to characterize the performance characteristics of a blade in stall as a function of its aspect ratio, airfoil thickness, and Reynolds number. This report documents results of the wind tunnel investigation of constant chord blades having four aspect ratios, with NACA 44XX series airfoil sections, at angles of attack ranging from -10 deg to 110 deg. Tests were conducted at Reynolds number ranging from 0.25 x 10 to the 6th power to 1.0 x 10 to the 6th power. The thickness ratios studied were 0.18, 0.15, and 0.12, and 0.09. The aspect ratios were 6, 9, 12 and infinity. Results of force and pitching moment measurements over the angle of attack range for all combinations of Reynolds numbers, thickness, and aspect ratios, and the effects of boundary layer tripping are presented. DOE

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N85-28932 Deutsches Museum, Munich (West Germany).
AIR TRAFFIC: INSTRUMENTS, AIRPORTS, COMPANIES, POST, CARGO AND PASSENGERS [LUFTVERKEHR: GERAETE, HAEFEN, GESELLSCHAFTEN, POST, FRACHT, PASSAGIERE]
Michael Matthes 1984 92 p refs In GERMAN Sponsored by Bundesministers fuer Bildung und Wissenschaften
Copyright. Avail: Issuing Activity

A historical review of air traffic is presented. The first motorized aircraft, the beginning of air traffic; from bomber aircraft to long distance aircraft; jet aircraft replacing the propeller aircraft; supersonic air traffic; large aircraft; and outlook of air traffic are discussed. Author (ESA)

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N85-28933# Defence Research Establishment, Ottawa. (Ontario).
A GENERAL AREA AIR TRAFFIC CONTROLLER SIMULATION USING COLOUR GRAPHICS
B. J. Ford Sep. 1983 151 p Original contains color illustrations
(Contract DREO-890)
(AD-A153634) Avail: NTIS HC A08/MF A01 CSCL 17/7

The increased speed of aircraft and a greater density of air traffic are overtaxing air traffic controllers. Automation of some portions of the controller's information and the use of color to highlight dangerous situations will make the controller's work easier and possibly more accurate. One of the major aims of the study is to show that the use of a different colors to indicate varying distances between aircraft is a definite improvement over a monochrome display. The other major aim is to study the advantages and disadvantages of vector display and raster display technologies when applied to the air traffic controller scenario. A new set of graphics display routines was developed to be used for the simulation. Much consideration was given to the best methods to optimize the display routines, with attention given to real-time constraints. GRA

N85-28934# Naval Postgraduate School, Monterey, Calif.
REVIEW AND EVALUATION OF PLANS TO INCORPORATE NAVSTAR GLOBAL POSITIONING SYSTEM USER EQUIPMENT ON MILITARY SEALIFT COMMAND SHIPS M.S. Thesis
A. R. Foureman Dec. 1984 160 p
(AD-A153799) Avail: NTIS HC A08/MF A01 CSCL 17/7

The NAVSTAR Global Positioning System (GPS) is a space-based navigation system scheduled to be fully operational; by 1990. GPS User Equipment (UE) is scheduled for installation on Navy ships commencing 1987. This thesis examines plans to incorporate GPS UE on Military Sealift Command (MSC) ships. The Naval Auxiliary Force and Special Mission Support ships have been funded and scheduled for military GPS UE. Plans for Strategic Sealift and Miscellaneous Service Support ships have not yet been made. Alternatives for equipping these ships with either commercial or military GPS UE are examined. Primary recommendations for MSC ships when GPS is operational with two-dimensional coverage (by the end of 1987) are: (1) equip Strategic Sealift ships with military GPS UE, (2) include GPS navigation equipment in ship enhancement programs, and (3) require GPS UE in MSC time and voyage charters. GRA

N85-28935# Sandia Labs., Albuquerque, N. Mex.
THE AFTI/F16 TERRAIN-AIDED NAVIGATION SYSTEM
D. D. Boozer, M. K. Lau, and J. R. Fellerhoff 1985 7 p refs Presented at the Natl. Aerospace and Electron. Conf., Dayton, Ohio, 20 May 1985
(Contract DE-AC04-76DP-00789)
(DE85-008411; SAND-85-0223C; CONF-8505116-1) Avail: NTIS HC A02/MF A01

A recursive, real time, terrain aided navigation algorithm, AFTI/SITAN, was designed for use on the Advanced Fighter Technology Integration (AFTI) F16 aircraft. The algorithm implemented in a Zilog Z8001 microprocessor, can reliably locate the aircraft's position within a 926-m (0.5 nm) CEP circle and accurately estimate its position continuously (3 Hz). The design and execution of the algorithm are described, and simulation results using actual flight test data are presented. A median accuracy of less than 100 m was achieved over gently rolling, forested terrain using cartographic-based digital terrain elevation data. DOE

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-28936 Department of the Air Force, Washington, D.C.
HEAT MANAGEMENT SYSTEM FOR AIRCRAFT Patent
A. H. Mayer, inventor (to Air Force) Issued 19 Mar. 1985 11 p Supersedes AD-D010635
(AD-D011658; US-Patent-4,505,124; US-Patent-Appl-SN-534996; US-Patent-Class-62-180) Avail: US Patent and Trademark Office CSCL 13/1

A novel heat management system for aircraft is provided which is based on the aircraft fuel as the heat exchange medium and comprises a dedicated thermal reserve fuel tank for containing refrigerated aircraft fuel (or other expendable liquid) which is cooled by heat exchange with the primary aircraft fuel flow to the engines, a fuel line loop for conducting fuel through a plurality of heat exchangers associated with cooling loops for heat generating aircraft systems, and a central microprocessor based controller for controlling fuel flow and temperature throughout the fuel loop system and into the aircraft engine. Author (GRA)

N85-28937*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FUTURE OF V/STOL AIRCRAFT SYSTEMS: A SURVEY OF OPINIONS
K. Clark White, Bedford A. Lampkin, and Harold Andrews (Naval Air Systems Command, Washington, D.C.) Jun. 1985 15 p refs (NASA-TM-86689; Rept-85146; NAS 1.15:86689) Avail: NTIS HC A02/MF A01 CSCL 01C

The recent success of the British Harriers in the Falkland Islands conflict vividly underscored the potential of V/STOL aircraft in military operations in a difficult environment. Despite this apparent success of the Harrier, there has been a major decline of V/STOL funding in the research and development budgets of the U.S. government and industry. The recent funding history of V/STOL systems is examined. Responses to a questionnaire which asked the question, Should there be an operational V/STOL aircraft other than the AV-8A and AV-8B in the military aircraft fleet of the U.S.A.? are presented and discussed. Author

N85-28938# Aeronautical Research Labs., Melbourne (Australia).
FURTHER INVESTIGATIONS TO IMPROVE THE FATIGUE LIFE OF THE MIRAGE 1110 WING MAIN SPAN
J. Y. Mann, A. S. Machin, and W. F. Lupson Jan. 1985 31 p refs
(ARL-Struc-TM-397; AR-003-984) Avail: NTIS HC A03/MF A01

Wing main spars of Mirage IIIIIO aircraft have undergone a refurbishment program to extend their fatigue lives by the installation of interference-fit steel bushes. A supplementary investigation has been carried out to assess two potential techniques for reducing the influence of empty rivet holes (namely the installation of interference-fit steel pins and adhesively-bonded aluminium rivets), and to assess the improvements in fatigue life which might be introduced by a redesign of the spar at the previously critical location. It was found that both treatments of the rivit holes resulted in a further small improvement in the life of specimens refurbished with interference-fit steel bushes at the bolt holes, and that these lives were not significantly different from that of specimens of the new design of spar in which the cross-sectional area increased and the rivet holes omitted. However, considerable improvements in life were obtained when the bolt holes in the redesigned spar specimens were either cold-expanded (a factor of 4.1) or had interference-fit steel bushes installed in them (a factor of 3.4). Author

N85-28939# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
EXPERIMENTAL AND THEORETICAL DETERMINATION OF THE WING-INDUCED LATERAL WIND ON THE TAIL SURFACES IN OSCILLATING ROLLING MOTION. PART 1: APPLICATION OF THE MOBILE OSCILLATING DERIVATIVES (MOD) ON AN EXPERIMENTAL PART Final Report [EXPERIMENTELLE UND THEORETISCHE ERMITTLUNG DES INDUZIERTEN SEITENWINDES AM SEITENLEITWERK BEI OSZILLIERENDER ROLLBEWEGUNG. ROLLBEWEGUNG. TEIL 1: EXPERIMENTELLER TEIL UNTER VERWENDUNG DER MOBILEN OSZILLIERENDEN DERIVATIVWAAGE]
Otto Determann and Juergen Oser 1 Dec. 1984 92 p refs In GERMAN 2 Vol.
(Contract BMFT-Ha-514/61)
(IFD-1/84-Pt-1) Avail: NTIS HC A05/MF A01

Induced oscillating lateral wind on tail surfaces was determined using a five-hole conical probe. The dynamic rolling-stability derivatives for force and moment measurement confirm the effects of the induced lateral wind. The experimental values are identical to the theoretical values. Author (ESA)

N85-28940# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Flugtechnik.
EXPERIMENTAL AND THEORETICAL DETERMINATION OF THE WING-INDUCED LATERAL WIND ON THE TAIL SURFACES IN OSCILLATING ROLLING MOTION. PART 2: THEORETICAL INVESTIGATIONS FOR CALCULATION OF THE LATERAL WIND Final Report [EXPERIMENTELLE UND THEORETISCHE ERMITTLUNG DES INDUZIERTEN SEITENWINDES AM SEITENLEITWERK BEI OSZILLIERENDER ROLLBEWEGUNG. TEIL 2: THEORETISCHE UNTERSUCHUNG ZUR BERECHNUNG DES SEITENWINDES]
Juergen Oser and Otto Determann 1 May 1984 50 p In GERMAN 2 Vol.
(Contract BMFT-Ha-514/61)
(IFD-1/84-Pt-2) Avail: NTIS HC A03/MF A01

The influence of geometrical parameters on ideal wing and wing-fuselage configurations was studied. The rolling lateral wind is calculated using the lifting line method for wings with different aspect ratios, sweeps and planform tapers as well as for the corresponding wing-fuselage combinations. The theoretical results give a general view of the effects of the wing and fuselage geometrical data and position on the rolling lateral wind. Author (ESA)

N85-28914# Technische Univ., Brunswick (West Germany). Inst. fuer Flugmechanik.
HELICOPTER AEROMECHANICS: INTRODUCTION AND HISTORICAL REVIEW
G. Reichert *In* AGARD Helicopter Aeromech. Apr. 1985 23 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

N85-28915# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
A SURVEY OF RECENT DEVELOPMENT IN HELICOPTER AERODYNAMICS
J. J. Philippe, P. Roesch, A. M. Dequin, and A. Cler *In* AGARD Helicopter Aeromech. Apr. 1985 40 p refs Prepared in cooperation with Societe Nationale Industrielle Aerospatiale, Marignane, France (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

N85-28917*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RECENT DEVELOPMENTS IN THE DYNAMICS OF ADVANCED ROTOR SYSTEMS
Wayne Johnson *In* AGARD Helicopter Aeromech. Apr. 1985 51 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01 CSCL 01C

N85-28920# Royal Aircraft Establishment, Bedford (England). Helicopter Aeromechanics Section.
FLIGHT TESTING FOR PERFORMANCE AND FLYING QUALITIES

G. D. Padfield *In* AGARD Helicopter Aeromech. Apr. 1985 51 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N85-28941*# Charles River Analytics, Inc., Cambridge, Mass.
EVALUATION OF A FAULT TOLERANT SYSTEM FOR AN INTEGRATED AVIONICS SENSOR CONFIGURATION WITH TSRV FLIGHT DATA Final Report
Alper K. Caglayan and Pankaj M. Godiwala Jun. 1985 101 p refs
(Contract NAS1-17719)
(NASA-CR-172589; NAS 1.26:172589; R-85-02) Avail: NTIS HC A06/MF A01 CSCL 01D

The performance analysis results of a fault inferring nonlinear detection system (FINDS) using sensor flight data for the NASA ATOPS B-737 aircraft in a Microwave Landing System (MLS) environment is presented. First, a statistical analysis of the flight recorded sensor data was made in order to determine the characteristics of sensor inaccuracies. Next, modifications were made to the detection and decision functions in the FINDS algorithm in order to improve false alarm and failure detection performance under real modelling errors present in the flight data. Finally, the failure detection and false alarm performance of the FINDS algorithm were analyzed by injecting bias failures into fourteen sensor outputs over six repetitive runs of the five minute flight data. In general, the detection speed, failure level estimation, and false alarm performance showed a marked improvement over the previously reported simulation runs. In agreement with earlier results, detection speed was faster for filter measurement sensors soon as MLS than for filter input sensors such as flight control accelerometers. Author

N85-28942# Applied Systems Inst., Inc., Washington, D.C.
AVIONICS DATA BASE USERS MANUAL Final Report
J. McGowan, D. J. Won, and D. VanEtten Jan. 1985 117 p
(Contract DTFA01-83-Y-30629)
(AD-A153810; FAA-APO-85-5) Avail: NTIS HC A06/MF A01 CSCL 01/3

This manual describes the uses, structure, and operating procedures-including data retrieval, entry and special functions-for the Avionics Data Base. This data base provides detailed data for avionics currently available for both air carrier and general aviation aircraft. Specific information contained in the data base includes price, weight, dimensions, manufacture, manufacture's address and telephone number, Technical Standard Order documentation, and ATA Specification 100 data. The Avionics Data Base was created using Microrim's R:Base Series 4000 Data Base Management System on the IBM Personal Computer. It contains three files or relations as they are referred to in this document. These relations are: Avionics - the relation that contains model specifications. Manufact - the relation that contains address and telephone number for the manufacturers. TSOREF - the relation that contains the Technical Standard Order (TSO) title, location, publication date and source document(s) for each TSO. Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-28943 Department of the Air Force, Washington, D.C.
STRUTLESS DIFFUSER FOR GAS TURBINE ENGINE Patent
G. H. Duncan, III and D. L. Cooper, inventors (to Air Force) Issued 12 Mar. 1985 5 p Supersedes AD-D010244
(AD-D011662; US-Patent-4,503,668; US-Patent-Appl-SN-484390; US-Patent-Class-60-39.32) Avail: US Patent and Trademark Office CSCL 21/5

This patent discloses an improved diffuser for a gas turbine engine which is mounted between a compressor section and a burner section. The diffuser eliminates struts by using the exit guide vanes of the compressor for support. The vanes are fixedly mounted to an inner case wall and to a double outer wall. A cantilevered case wall being one of the double outer walls can flex both radially and axially to relieve thermal stress in the vanes. Additionally, probes can be mounted in access ports formed in the double outer wall. Compressor leakage gas is prevented from entering voids in the double outer wall by a seal seated between the cantilevered case wall and the other case wall. GRA

N85-28944*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ADVANCED SECONDARY POWER SYSTEM FOR TRANSPORT AIRCRAFT
Anthony C. Hoffman, Irving G. Hansen, Raymond F. Beach, Robert M. Plencner, Robert P. Dengler, Kent S. Jefferies, and Robert J. Frye May 1985 38 p refs
(NASA-TP-2463; E-2434; NAS 1.60:2463) Avail: NTIS HC A03/MF A01 CSCL 21E

A concept for an advanced aircraft power system was identified that uses 20-kHz, 440-V, sin-wave power distribution. This system was integrated with an electrically powered flight control system and with other aircraft systems requiring secondary power. The resulting all-electric secondary power configuration reduced the empty weight of a modern 200-passenger, twin-engine transport by 10 percent and the mission fuel by 9 percent. Author

N85-28945*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEAN: A PROGRAM FOR DYNAMIC ENGINE ANALYSIS
Gerald G. Sadler and Kevin J. Melcher 1985 18 p refs Proposed for presentation at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored by AIAA, SAE and ASME Prepared in cooperation with Army Research and Technology Labs.
(NASA-TM-87033; E-2588; NAS 1.15:87033; USAVSCOM-TR-85-C-10) Avail: NTIS HC A02/MF A01 CSCL 21E

The Dynamic Engine Analysis program, DEAN, is a FORTRAN code implemented on the IBM/370 mainframe at NASA Lewis Research Center for digital simulation of turbofan engine dynamics. DEAN is an interactive program which allows the user to simulate engine subsystems as well as a full engine systems with relative ease. The nonlinear first order ordinary differential equations which define the engine model may be solved by one of four integration schemes, a second order Runge-Kutta, a fourth order Runge-Kutta, an Adams Predictor-Corrector, or Gear's method for still systems. The numerical data generated by the model equations are displayed at specified intervals between which the user may choose to modify various parameters affecting the model equations and transient execution. Following the transient run, versatile graphics capabilities allow close examination of the data. DEAN's modeling procedure and capabilities are demonstrated by generating a model of simple compressor rig. Author

N85-28946# Universal Energy Systems, Inc., Dayton, Ohio.
MULTI-DUCTED INLET COMBUSTOR RESEARCH AND DEVELOPMENT Final Report, 31 Aug. 1981 - 31 Aug. 1984
Gary D. Streby Wright-Patterson AFB, Ohio AFWAL Mar. 1985 26 p refs
(Contracts F33615-81-C-2074; SB5448-81-C-0518)
(AD-A153753; AFWAL-TR-85-2004) Avail: NTIS HC A03/MF A01 CSCL 21/5

Hydrodynamic simulations were conducted of dual inlet side dump combustor configurations to obtain flow visualization and residence time data using the Water Tunnel test rig facility of the Ramjet Technology Branch AFWAL/PORT Wright-Patterson AF3, Ohio. Tests were conducted for inlet duct angles of 30, 45, and 60 degrees for variations in the combustor dome plate height from 0.0 to 6.0 inches, for total combustor fluid flow rates of 200, 300 and 400 gallons per minute, for nozzle area to combustor area ratios of 0.20, 0.29 and 0.39, and for combustor lengths of 20.13, 39.0 and 53.25 inches. The inlet duct Reynolds Numbers for each total flow rate tested were 125,640 for 200 gallons per minute, 188,400 for 300 gallons per minute, and 251,300 for 400 gallons per minute. Also reported on are specialized research efforts concluded to support advanced combustor studies. GRA

N85-28947# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Aerodynamics and Airframe Branch.
IMPROVED STATISTICAL ANALYSIS METHOD FOR PREDICTION OF MAXIMUM INLET DISTORTION Final Report, 1 Jan. 1983 - 31 Mar. 1984
Dennis Sedlock Mar. 1985 116 p refs
(AD-A153767; AFWAL-TR-84-3085) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report presents the results of an investigation to develop an analytical method which predicts the maximum pressure distortion level and provides a synthesized pressure distortion map at the entrance to the turbine engine compression system. The method uses inlet total pressure statistical properties and a random number process to predict the most probable maximum pressure distortion and pressure distortion map. The validity of the method is demonstrated by comparing predicted maximum distortion levels and pressure contour maps with measured peak distortion levels and pressure contour maps obtained from analog screening of inlet pressure data. GRA

N85-28948# Tennessee Univ., Tullahoma.
COMPRESSOR AND TURBINE MODELS - NUMERICAL STABILITY AND OTHER ASPECTS Final Report, 1 May 1982 - 1 May 1984
K. C. Reddy and S. N. Nayani AEDC Apr. 1985 70 p
(Contract F40600-82-C-0003)
(AD-A153811; AEDC-TR-85-5) Avail: NTIS HC A04/MF A01 CSCL 12/1

This report deals with the mathematical-numerical models used at AEDC for the simulation of aircraft engine compressors and turbines. Numerical stability problems encountered in a one-dimensional compressor model (COMP2SP) have been eliminated with appropriate changes in the algorithm. A multidimensional finite volume code (ATAC), which simulates the operation of a turbine, has been analyzed, and the source of numerical oscillations in that code has been isolated. Subsequently, proper changes to the ATAC code have been made at AEDC and numerical oscillations have been eliminated. Stage characteristics based on the total pressure loss coefficient and the deviation angle as functions of incidence angle have been found to be less sensitive to errors in interpolation for intermediate speeds than the pressure and temperature coefficients as functions of the flow coefficient. Multidimensional compressor model equations suitable for simulating the circumferentially distorted flows have been developed. Characteristics and compatibility equations are derived for the imposition of inflow and outflow boundary condition. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N85-28949*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PILOTED SIMULATION OF AN ALGORITHM FOR ONBOARD CONTROL OF TIME-OPTIMAL INTERCEPT
Douglas B. Price, Anthony J. Calise (Drexel Univ.), and Daniel D. Moerder (Information and Control Systems, Inc., Hampton, Va.) Jun. 1985 48 p refs
(NASA-TP-2445; L-15896; NAS 1.60:2445) Avail: NTIS HC A03/MF A01 CSCL 01C

A piloted simulation of algorithms for onboard computation of trajectories for time-optimal intercept of a moving target by an F-8 aircraft is described. The algorithms, use singular perturbation techniques, generate commands in the cockpit. By centering the horizontal and vertical needles, the pilot flies an approximation to a time-optimal intercept trajectory. Example simulations are shown and statistical data on the pilot's performance when presented with different display and computation modes are described. E.A.K.

N85-28950# National Aerospace Lab., Tokyo (Japan).
GUST LOAD ALLEVIATION OF A CANTILEVERED RECTANGULAR ELASTIC WING. WIND TUNNEL EXPERIMENT AND ANALYSIS
1984 37 p refs In JAPANESE; ENGLISH summary
(NAK-TR-86; ISSN-0089-4010) Avail: NTIS HC A03/MF A01

An experimental and theoretical study on gust load alleviation (GLA) of a cantilevered rectangular elastic wing with an active aileron was described. The beneficial effects predicted by the theoretical analysis were verified in a low subsonic wind tunnel. The root mean square value of the wing motion to random gust decreased by 45-50% when the GLA system was turned on. The aileron was actuated according to the first order control law. The law used was obtained by modifying an optimal control law of seventh order which was originally formulated with the aid of an LQG approach. In the mathematical wing model, only the first bending mode and aileron motions were taken into account because the frequencies of the second and higher modes of the wing were much higher than the frequency spectrum contained in the gust generated. The unsteady aerodynamic prediction incorporated in the GLA system was corrected by test data for steady flow so that the response due to the aileron motion was estimated with good accuracy. E.A.K.

N85-28918# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Flugmechanik.
MISSION REQUIREMENTS AND HANDLING QUALITIES
B. L. Gmelin and H.-J. Pausder *In* AGARD Helicopter Aeromech. Apr. 1985 37 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N85-28951*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DOUBLE WINDOW VIEWING CHAMBER ASSEMBLY Patent

Application
Vernon W. Keller, Robert B. Queen, Bobby R. Elkin, and William L. White, inventors (to NASA) Filed 2 May 1985 12 p
(NASA-Case-MFS-28057-1; NAS 1.71:MFS-28057-1;
US-Patent-Appl-SN-729766) Avail: NTIS HC A02/MF A01 CSCL 14B

A viewing chamber which permits observation of a sample retained therein includes a pair of double window assemblies mounted in opposed openings in the walls thereof so that a light beam can directly enter and exit from the chamber. A flexible mounting arrangement for the outer windows of the window assemblies enables the windows to be brought into proper alignment. An electrical heating arrangement prevents fogging of the outer windows whereas desiccated air in the volume between the outer and inner windows prevents fogging of the latter. NASA

N85-28952# National Aerospace Lab., Tokyo (Japan).
FLOW QUALITY OF NATIONAL AEROSPACE LABORATORY TWO-DIMENSIONAL TRANSONIC WIND TUNNEL. PART 3: FLOW TURBULENCE LEVEL AND MEASURING METHOD
Yasuo Oguni Mamoru Sato, Hiroshi Kanda, Seizo Sakakibara, Hitoshi Miwa, and Shigeo Baba 1984 29 p refs In JAPANESE; ENGLISH summary
(NAL-TR-842-Pt-3; ISSN-0389-4010) Avail: NTIS HC A03/MF A01

The flow turbulence level of the NAL two dimensional transonic wind tunnel was measured with a constant temperature hot wire anemometer using a hot film probe. The fluctuation of the mass flow is within a range of 0.3%-0.45% with Mach numbers of 0.2 to 0.8 and unit Reynolds numbers of 1.8 x 10 to the 5th to 5.5 x 10 to the 5th (1/cm). The fluctuation of the total temperature was one seventh to one tenth of the mass flow fluctuation. A plain sound wave was assumed, and the noise data was measured simultaneously with the turbulence and compared with this turbulence. An attempt was made to separate the velocity fluctuation and the density fluctuation in the mass flow. The future development of this complex method is discussed. Author

N85-28953# National Aerospace Lab., Tokyo (Japan).
ON POWER EFFECIENT OPERATION OF THE 2m X 2m TRANSONIC WIND TUNNEL AT THE NATIONAL AEROSPACE LABORATORY
Masataka Shirai, Seigou Nakamura, Masamitu Suzuki, Akira Koike, Koichi Suzuki, and Nobuhiko Kamiya 1984 25 p refs In JAPANESE; ENGLISH summary
(NAL-TR-847; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

In the conventional test procedure using the 2m x 2m transonic wind tunnel, an auxiliary power unit is operated synergistically for Mach numbers near and above unity to establish the desired Mach number at the test section by suction through the perforated test section walls. The extent to which the test Mach number can be increased without the use of the auxiliary power unit was investigated. It is found that a Mach number of 1.06 is attained by adequately adjusting several geometric parameters such as diverging angle of the side walls of the test section, opening width of the diffuser flaps, width of the second throat and the flexible nozzle setting. Electric power of 7800kW can be served at Mach number 1 by using this procedure compared with the conventional procedure in which an auxiliary fan is used. Mach number distributions at the test section are found to be little influenced by these adjustments. E.A.K.

N85-28954# Center for Naval Analyses, Alexandria, Va. Naval Planning Manpower and Logistics Div.
THE USE OF FLIGHT SIMULATORS IN MEASURING AND IMPROVING TRAINING EFFECTIVENESS
A. J. Marcus and L. E. Curran Jan. 1985 25 p
(Contract N00014-83-C-0725)
(AD-A153817; CNA-PP-432) Avail: NTIS HC A02/MF A01 CSCL 05/9

This paper studies the value of the aircraft simulators as measures of training readiness. Simulator evaluations are analyzed for reserves enlisted crewmen on Navy patrol aircraft. Part-time reservists are found to have very little skill loss over time and perform as well as their full-time counterparts. Experience in the simulator produces substantial increases in subsequent flights appear to be useful measures of readiness and valuable training experience. GRA

N85-28955# Rijksluchtvaartdienst, The Hague (Netherlands).
OWEMA REPORT: A PROJECT STUDY CONCERNING THE POSSIBILITIES AND THE DESIRABILITY OF A EAST-WEST RUNWAY FOR MAASTRICHT AIRPORT (NETHERLANDS) AS A EURO-REGIONAL AIR FREIGHT CENTER [OWEMA-RAPPORT: EEN PROJECTSTUDIE OMTRENT DE MOGELIJKHEDEN EN DE WENSELIJKHEID VAN EEN OOST-WESTBAN VOOR MAASTRICHT AIRPORT ALS EUREGIONAAL VRACHTCENTRUM]
Mar. 1984 157 p refs In DUTCH
(B8476490; ISBN-90-346-02478) Avail: NTIS HC A08/MF A01

A planned runway for an airport in the southeast Netherlands is discussed. Transportation developments, the financial and exploitation possibilities, as well as the regional and environmental consequences are considered. The project is supported.
Author (ESA)

N85-28919# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
THE ROLE OF SIMULATION
H. Huber and P. Krauspe *In* AGARD Helicopter Aeromech. Apr. 1985 35 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N85-28956# Societe Nationale Industrielle Aerospatiale, Les Mureaux (France). Div. Systemes Balistiques et Spatiaux.
IN ORBIT INFRASTRUCTURE Final Report
J. Lacaze 22 Jun. 1983 27 p
(Contract ESA-5163/82)
(SNIAS-S/DT-24-996; ESA-CR(P)-1984) Avail: NTIS HC A03/MF A01

A systematic approach to space activity by using a standardized automated multipurpose system of transportation and accomodation to, in, and from orbit, called In-Orbit Infrastructure (IOI) is discussed. The IOI needs of commercial space platforms for Earth observations, telecommunication, and space processing are identified. Rendezvous and docking, robotics, re-entry, and operational aspects are considered. A modular logistics and resupply vehicle is defined. An IOI implementation scenario is outlined. Author (ESA)

N85-29090# Joint Publications Research Service, Arlington, Va.
SPACE INSURANCE FIRMS VIEW SHUTTLE, ARIANE RELIABILITY
Fabio Pagan *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1984 p 4-7 Transl. into ENGLISH from Aviazione (Rome), May 1984 p 288-289 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

N85-29096# Joint Publications Research Service, Arlington, Va.
NEW ESA DIRECTOR ON ARIANE, SPACE STATION, FUTURE TRENDS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 1-4 Transl. into ENGLISH from Flug Rev. (Stuttgart), Jul. 1984 p 32-33 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

N85-29111# Joint Publications Research Service, Arlington, Va.
DFVLR STUDY RECOMMENDS EUROPEAN INDEPENDENCE IN

SPACE SYSTEMS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 19-24 Transl. into ENGLISH from Frankfurter Z. Blick Durch die Wirtsch. (Frankfurt am Main), 27 Aug. 1984 p 3 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N85-28957# National Aerospace Lab., Amsterdam (Netherlands). Space Div.
APPLICATION OF MODEL FOLLOWING CONTROL AND ESTIMATION TECHNIQUES TO ATTITUDE CONTROL OF MANEUVERING SPACECRAFT. PART 1: THEORY AND SIMULATION RESULTS
T. Zwartbol, A. P. Terpstra, P. Th. L. M. vanWoerkom, and R. F. vandenDam 10 Oct. 1982 122 p refs
(Contract NIVR-1771; NIVR-1858)
(NLR-TR-82116-U-Pt-1; B8477223) Avail: NTIS HC A06/MF A01

An approach to on-board sampled data estimation and control of the attitude motion of maneuvering spacecraft is presented. Algorithms for model following control of attitude maneuvers; estimation of spacecraft state (attitude, angular velocity, disturbance, torque); and optical-inertial attitude determination, with estimation of gyro parameters (drift rate bias, scale factor error) were developed. The algorithms were validated in single-axis software simulations of an attitude control system of the type used in the Infrared Astronomical Satellite. The control system comprises a strapdown rate-integrating gyro and a slit-type star sensor for optical-inertial attitude sensing, a reaction wheel actuator, and a digital on-board computer. The truth models for simulation of the hardware components are discussed.
Author (ESA)

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

No abstracts in this category.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N85-28958*# Rockwell International Corp., Downey, Calif. Space Station Systems Div.
SPACE STATION CREW SAFETY ALTERNATIVES STUDY. VOLUME 4: APPENDICES Final Report
R. L. Peercy, Jr., R. F. Raasch, and L. Rockoff Washington NASA Jun. 1985 111 p
(Contract NAS1-17242)
(NASA-CR-3857; NAS 1.26:3857; SSD84-0053-Vol-4) Avail: NTIS HC A06/MF A01 CSCL 22B

The scope of this study considered the first 15 years of accumulated space station concepts for Initial Operational Capability (10C) during the early 1990's. Twenty-five threats to the space station are identified and selected threats addressed as impacting safety criteria, escape and rescue, and human factors safety concerns. Of the 25 threats identified, eight are discussed including strategy options for threat control: fire, biological or toxic contamination, injury/illness, explosion, loss of pressurization, radiation, meteoroid penetration and debris. B.W.

N85-29103# Joint Publications Research Service, Arlington, Va.
ARIANE SPACE GENERAL DIRECTOR ON SATELLITE LAUNCHER MARKET
Jacques Girardon *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-035) 29 Oct. 1984 p 4-9 Transl. into ENGLISH from Sci. and Avenir (Paris), Sep. 1984 p 48-51 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

N85-29104# Joint Publications Research Service, Arlington, Va.
BRITISH SUPER-SHUTTLE Abstract Only
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-035) 29 Oct. 1984 p 10 Transl. into ENGLISH from AFP Sci. (Paris), 30 Aug. 1984 p 26 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

N85-29113# Joint Publications Research Service, Arlington, Va.
SWEDISH SPACE PROGRAM INCLUDES RESEARCH SATELLITES
Stig Nordfeldt *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 27-31 Transl. into ENGLISH from Manads J. (Stockholm), Oct. 1984 p 102-107 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N85-29112# Joint Publications Research Service, Arlington, Va.
ASTRONAUTICAL CONFERENCE HEARS DETAILS ON HERMES MINISHUTTLE
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 25-26 Transl. into ENGLISH from AFP Sci. (Paris), 11 Oct. 1984 p 16-18 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

No abstracts in this category.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N85-28959 Marconi Space Systems Ltd., Portsmouth (England).
SPACE STATION STUDY Final Report
Sep. 1984 90 p
(Contract A57A/1667)
(BL-6167) Copyright. Avail: Issuing Activity

The benefits and disadvantages to British industry of participating in a NASA space station are discussed. The main station, free flying platforms, and transfer vehicles are described. Life science, Earth science, materials science, and astronomy applications are summarized. The power, data management, communications, and remote sensing requirements of the space station are considered. Author (ESA)

N85-28960# Joint Publications Research Service, Arlington, Va.
WEST EUROPEAN REPORT: SCIENCE AND TECHNOLOGY
8 Nov. 1984 59 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-036) Avail: NTIS HC A04/MF A01

Progress in West European science and technology is reported. Topics discussed include: material science, aerospace technology, automobile industry, civil aviation, computers, factory automation, microelectronics, and scientific and industrial policy. For individual titles, see N85-28961 through N85-28962.

N85-28961# Joint Publications Research Service, Arlington, Va.
SOME EUROPEANS VOICE OPPOSITION TO SPACE STATION PARTICIPATION
Guenter Paul *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-036) 8 Nov. 1984 p 3-6 Transl. into ENGLISH from Frankfurter Allgem. Z. (Frankfurt am Main), 29 Aug. 1984 p 25 (For primary document see N85-28960 18-18)
Avail: NTIS HC A04/MF A01

The pros and cons of the European Space Agency's (ESA) participation in the American space station are discussed. It is conceded that the space stations orbits are unsuitable for space exploration. Participation of ESA in the American space station will eliminate European space missions and promotion of space travel for commercial exploitation is no longer valid. E.A.K.

N85-28962# Joint Publications Research Service, Arlington, Va.
NEW ESA DIRECTOR ON SPACE STATION, MILITARY SPACE
Christoph Bertram, Guenter Haff, and Heinz Michaels *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-036) 8 Nov. 1984 p 7-18 Transl. into ENGLISH from Die Zeit (Hamburg), 31 Aug. 1984 p 9-11 (For primary document see N85-28960 18-18)
Avail: NTIS HC A04/MF A01

Participation of ESA in the American space station program is discussed with ESA's new director. It is conceded that the growing presence of Europeans in space may cause military problems, even through the ESA's programs and the privately organized satellite shopping service Ariane-space serve exclusively for peaceful purposes. The Esa faces an important task in planning and coordinating future European Space projects. E.A.K.

N85-28963# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
FINITE ELEMENT THERMAL-STRUCTURAL ANALYSIS OF CABLE-STIFFENED SPACE STRUCTURES Final Report, 1 Jun. - 31 Dec. 1982
E. A. Thornton and A. K. Pandy Wright-Patterson AFB, Ohio AFWAL Oct. 1984 107 p
(Contract F33615-82-K-3219)
(AD-A153822; AFWAL-TR-84-3079) Avail: NTIS HC A06/MF A01 CSCL 22/1

Finite element thermal-structural analyses of cable-stiffened space structures are presented. A computational scheme for calculation of prestresses in the cable-stiffened structures is also described. The determination of thermal loads on orbiting space structures due to environmental heating is described briefly. Three finite element structural analysis techniques are presented for the analysis of prestressed structures. Linear, stress stiffening and large displacement analysis techniques are investigated. The three techniques are employed for analysis of prestressed cable structures at different prestress levels. The analyses produce similar results at small prestress but at higher prestress, differences between the results become significant. For the cable-stiffened structures studied, the linear analysis technique may not provide acceptable results. The stress stiffening analysis technique may yield results of acceptable accuracy depending on the prestress. The large displacement analysis technique produces accurate results over a wide range of prestresses and is recommended as a general analysis technique for thermal-structural analysis of cable-stiffened space structures. Author (GRA)

N85-28964# MATRA Espace, Paris-Velizy (France).
MAINTENANCE OF LONG LIFE SPACE SYSTEMS, VOLUME 1 Executive Summary
J. L. Lacombe Oct. 1981 100 p 2 Vol.
(Contract ESA-4267/80-F-DD(SC))
(Matra-0316/DX60-Vol-1; ESA-CR(P)-1985-Vol-1) Avail: NTIS HC A05/MF A01

Analysis of in-orbit maintenance is used to derive concepts of main maintainable or refuelable spacecraft, as well as of freighter and/or tanker servicers. Causes limiting satellite life expectancy and relibility are explained. A design analysis is presented for docking subsystems maintenance manipulator systems and tools. General information is presented concerning maintenance on telecommunication satellites in geostationary orbit. Mathematical models are presented. B.W.

N85-28965# MATRA Espace, Paris-Velizy (France).
MAINTENANCE OF LONG LIFE SPACE SYSTEMS, VOLUME 2 Final Report
J. L. Lacombe Oct. 1981 241 p refs 2 Vol.
(Contract ESA-4267/80-F-DD(SC))
(Matra-0350/DX60-Vol-2; ESA-CR(P)-1985-Vol-2) Avail: NTIS HC A11/MF A01

Problem areas and required technological R&D for maintenance activities for European space missions are identified and the interest of in-orbit maintenance is shown. Analysis of in-orbit maintenance is used to derive concepts of maintainable or refuelable spacecraft, as well as of freighter and/or tanker servicers. Changes in satellite design to provide maintainability, and design guidelines for maintenance satellites are outlined. Unmanned maintenance operations are discussed. Design concepts for rendezvous and docking subsystems, maintenance manipulator systems, interfaces, and tools are suggested. Maintenance of a telecommunication satellite in geostationary orbit is considered. Author (ESA)

N85-28966# MATRA Espace, Paris-Velizy (France).
IN ORBIT INFRASTRUCTURE Final Report
P. Molette, C. Cougnet, J. L. Lacombe, P. Sharp (Erno Raumfahrttechnik GmbH), W. Kleinau (MBB), J. Fave (ONERA), H. Francois (Dornier-Werke GmbH), R. C. Parkinson (BAE), and E. Turci (Aeritalia) 18 Mar. 1983 93 p
(Contract ESA-5164/82-F-FC(SC))
(DM-51/CC-FL-044-83; ESA-CR(P)-1986) Avail: NTIS HC A05/MF A01

The review of potential European mission trends through the next two decades shows an evolution of the relevant two space segment towards heavier and larger spacecraft. The analysis of the future commercial missions, indicates that their implementation in space, their operational utilization and possibly their maintenance in orbit will require a common in orbit infrastructure. A system of

transportation and accommodation to, in and from orbit, called In-Orbit Infrastructure (IOI) is discussed. The IOI needs of commercial space platforms for Earth observations, telecommunication and space processing are examined. B.W.

N85-28967# National Aerospace Lab., Amsterdam (Netherlands).
THE ATTITUDE CONTROL MODEL TESTS FOR THE INFRARED ASTRONOMICAL SATELLITE (IRAS)
1983 15 p In DUTCH; ENGLISH summary Sponsored by Netherlands Agency for Aerospace Programs
(B8580071) Avail: NTIS HC A02/MF A01

The flight model of a three-axes stabilized system, containing a Philips P 856 on-board computer, gyroscopes Sun sensors, and a split-type star sensor controlled by reaction wheels, damped by a three-axis magnetometer and three identical magnetic coils, was tested. To safeguard the telescope a horizon sensor is used with the Sun sensor. The tests were performed on an air-bearing table, using simulators to provide the input of the sensors; the ground station was represented by an EAI-PACER 600 laboratory computer. Results show that the noise is far below the stipulated maximum. Author (ESA)

N85-29087# Joint Publications Research Service, Arlington, Va.
ESA PRESENTS PLANS FOR EUROPEAN MANNED SPACE STATION
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-022) 2 Jul. 1984 p 4-10 Transl. into ENGLISH from AFP Sci. (Paris), 10 May 1984 p 23-29 (For primary document see N85-29086 18-31)
Avail: NTIS HC A04/MF A01

N85-29091# Joint Publications Research Service, Arlington, Va.
DFVLR OFFICIAL ON AREAS OF US-FRG SPACE STATION COOPERATION
Harmut Sax *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1984 p 8-22 Transl. into ENGLISH from DFVLR-Nachrichten (Cologne), Jun. 1984 p 19-25 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N85-28968*# National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL RESEARCH ON ELECTRICAL PROPULSION. NOTE 2: EXPERIMENTAL RESEARCH ON A PLASMA JET WITH VORTEX TYPE STABILIZATION FOR PROPULSION
A. C. Robotti and M. Oggero Jun. 1985 18 p ref Transl. into ENGLISH from Sci. Res. (Rome), vol. 2, no. 1, series 2, session A, 1962 p 14-22 Original language document was announced as N70-73212 Transl. by The Corporate Word, Inc., Pittsburgh, Pa.
(Contract NASw-4006)
(NASA-TM-77874; NAS 1.15:77874) Avail: NTIS HC A02/MF A01 CSCL 21C

Results of experimental electric propulsion research are presented. A plasma generator, with an arc stabilized by an air vortex is examined. The heat transfer efficiency between arc and fluid environment at a varying current and flow rate is discussed. B.W.

N85-28969*# National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL RESEARCH ON ELECTRICAL PROPULSION
Aurelio C. Robotti and Mario Oggero Jun. 1985 16 p refs Transl. into ENGLISH from Sci. Res. (Rome), vol. 3, no. 1, Jan. 1963 p 20-27 Original language document was announced as N70-75496 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77876; NAS 1.15:77876) Avail: NTIS HC A02/MF A01 CSCL 21C

This paper describes work on arcs rotating in a magnetic field. Particular care was taken about the design of the electrodes in order to achieve long-time operation. Successful performance tests were carried out. B.W.

N85-28970# National Aerospace Lab., Tokyo (Japan).
EFFECTIVE SPECIFIC IMPULSE OF SECONDARY FLOW INJECTED INTO A ROCKET NOZZLE
Hiroshi Miyajima, Kazuo Kusaka, and Eiji Sogame Dec. 1984 12 p refs
(NAL-TR-848T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The effective specific impulse of secondary flow injected into a supersonic portion of a large area ratio nozzle was evaluated. An oxygen/hydrogen thrust chamber with a 4000N thrust level and a chamber pressure of 3.5MPa was used. The secondary was injected through 30 discrete holes at a 13:1 local area ratio into a nozzle with a 140:1 overall area ratio. The mass flow ratio of secondary flow to primary flow was varied from 1 to 5%. Experimentally obtained effective secondary flow specific impulse Is was compared with calculated results. The experimental Is value was consistently higher than the calculated value by about 20%, presumably because of mixing and heat transfer effects which were not taken into account in the theoretical calculation. The secondary flow film cooling effect was substantial and persisted up to the nozzle exit. E.A.K.

N85-28971*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN EVALUATION OF OXYGEN-HYDROGEN PROPULSION SYSTEMS FOR THE SPACE STATION
R. W. Klemetson, P. W. Garrison, and N. P. Hannum 1985 28 p refs Presented at the 21st Joint Propulsion Conf., Monterey, Calif., 8-10 Jul. 1985; sponsored in part by AIAA, SAE, ASME, and ASEE Prepared in cooperation with JPL, Pasadena, Calif.
(NASA-TM-87059; E-2628; NAS 1.15:87059) Avail: NTIS HC A03/MF A01 CSCL 21H

Conceptual designs for O2/H2 chemical and resistojet propulsion systems for the space station was developed and evaluated. The evolution of propulsion requirements was considered as the space station configuration and its utilization as a space transportation node change over the first decade of operation. The characteristics of candidate O2/H2 auxiliary propulsion systems are determined, and opportunities for integration with the OTV tank farm and the space station life support, power and thermal control subsystems are investigated. OTV tank farm boiloff can provide a major portion of the growth station impulse requirements and CO2 from the life support system can be a significant propellant resource, provided it is not denied by closure of that subsystem. Waste heat from the thermal control system is sufficient for many propellant conditioning requirements. It is concluded that the optimum level of subsystem integration must be based on higher level space station studies. Author

N85-28972# L'Air Liquide, Sassenage (France). Dept. de Construction et de Vente Mecanique.
INVESTIGATION, DEVELOPMENT, AND CERTIFICATION OF A

BURST DISK FOR CRYOGENIC FUEL TANKS Final Report [ETUDE, DEVELOPMENT ET QUALIFICATION DUN DISQUE DECLATEMENT POUR RESERVOIR CRYOGENIQUE]
Marc Till 17 Feb. 1983 51 p In FRENCH
(Contract ESTEC-5080/82-NL-PB(SC))
(GCP-3/MT-CM-21-2546; ESA-CR(P)-1993) Avail: NTIS HC A04/MF A01

A disk which allows excess pressure caused by the expansion of cryogenic fuel following a sudden temperature increase due to handling errors or accidents to be dissipated without rupturing the tank was developed. The device is mounted between the fuel tank and a line connected to the external atmospheric pressure. It maintains pressure inside the tank at 2 bar and operates in the temperature range from 1 to 375K. Vibration tests show that the valve does not open erroneously due to vibrations occurring during launch. Flight simulations corresponding to 10 missions reveal a drift in opening pressures outside specification, but this drift is probably due to the length of vibrations applied. Author (ESA)

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N85-28973* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PHENOXY RESINS CONTAINING PENDENT ETHYNYL GROUPS AND CURED RESINS OBTAINED THEREFROM Patent
Paul M. Hergenrother, inventor (to NASA) Issued 9 Apr. 1985 8 p Filed 10 May 1984 Sponsored by NASA
(NASA-Case-LAR-13262-1; US-Patent-4,510,296; US-Patent-Appl-SN-608741; US-Patent-Class-525-534; US-Patent-Class-525-532; US-Patent-Class-528-86) Avail: US Patent and Trademark Office CSCL 07C

Phenoxy resins containing pendent ethynyl groups, the process for preparing the same, and the cured resin products obtained therefrom are disclosed. Upon the application of heat, the ethynyl groups react to provide branching and crosslinking with the cure temperature being lowered by using a catalyst if desired but not required. The cured phenoxy resins containing pendent ethynyl groups have improved solvent resistance and higher use temperature than linear uncrosslinked phenoxy resins and are applicable for use as coatings, films, adhesives, composited matrices and molding compounds. Author

N85-28974# Oak Ridge National Lab., Tenn. Analytical Chemistry Div.
ANALYTICAL CHEMISTRY DIVISION Annual Progress Report, period ending 31 Dec. 1984
W. S. Lyon, ed. Apr. 1985 97 p refs
(Contract DE-AC05-84OR-21400)
(DE85-010585; ORNL-6139; M85010585) Avail: NTIS HC A05/MF A01

Progress reports are presented for the following sections: analytical methodology; mass and emission spectroscopy; radioactive materials analysis; bio/organic analysis; and general and environmental analysis; quality assurance, safety, and tabulation analyses. In addition a list of publications and oral presentations and supplemental activities are included. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N85-28975*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LIGHTWEIGHT PISTON Patent Application
Allan H. Taylor, inventor (to NASA) Filed 2 May 1985 13 p
(NASA-Case-LAR-13150-1; NAS 1.71:LAR-13150-1; US-Patent-Appl-SN-729767) Avail: NTIS HC A02/MF A01 CSCL 11D

A lightweight piston 12 composed of carbon-carbon composites is presented. The use of carbon-carbon composites over conventional materials, such as aluminum, reduces piston weight and improves thermal efficiency of the internal combustion reciprocation engine. Due to the negligible coefficient of thermal expansion and unique strength at elevated temperatures of carbon-carbon, the piston-to-cylinder wall 10 clearance is so small as to eliminate the necessity of piston rings. Use of the carbon-carbon composite piston has the effect of reducing the weight of other reciprocating engine components allowing the piston to run at higher speeds and improving specific engine performance. NASA

N85-28976*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LIGHT WEIGHT FIRE RESISTANT GRAPHITE COMPOSITES Patent Application
Demetrius A. Kourtides, John A. Parker, and Minga-ta S. Hsu, inventors (to NASA) (HC Chem Research and Service Corp.) Filed 28 Feb. 1985 36 p
(NASA-Case-ARC-11615-1-SB; NAS 1.71:ARC-11615-1-SB; US-Patent-Appl-SN-06/706682) Avail: NTIS HC A03/MF A01 CSCL 11D

Composite structures with a honeycomb core and characterized by lightweight and excellent fire resistance are provided. These sandwich structures employ facesheets made up of bismaleimide-vinyl styrylpyridine copolymers with fiber reinforcement such as carbon fiber reinforcement. In preferred embodiments the facesheets are over-layered with a decorative film. The properties of these composites make them attractive materials of contruction for aircraft and spacecraft. NASA

N85-28977# National Aerospace Lab., Tokyo (Japan).
NUMERICAL ANALYSIS OF END EFFECTS IN SYMMETRIC LAMINATED PLATES
Hidehito Okumura 1985 13 p refs In JAPANESE; ENGLISH summary
(NAL-TR-850; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Stress eigenstates at the loaded end in symmetric laminated plates are discussed in this paper. The rate of attenuation of nonuniform stress distribution in composite materials is slow in comparison with that in isotropic materials. For a graphite/epoxy cross-ply laminate, for example, the characteristics length lambda e is approximately three times that for an isotropic material. It is emphasized that the evaluation by numerical method of this decay is important in estimating the strength of composite laminated plates. Author

N85-28978# North Carolina State Univ., Raleigh. Dept. of Materials Engineering.
EROSION OF MULTIPHASE MATERIALS
K. Anand, C. Morrison, R. O. Scattergood, H. Conrad, J. L. Routbort (Argonne National Lab.), and R. Warren (Chalmers Tekniska Hoegskola, Goeteborg) 1984 24 p refs Presented at the 2nd Intern. Conf. on the Sci. of Hard Mater., Rhodes, Greece, 23-28 Sep. 1984
(Contract DE-FG05-84ER-45115)
(DE85-008895; CONF-8409117-1) Avail: NTIS HC A02/MF A01

Erosion rate measurements were made for a series of WC-Co alloys with varying WC-Co grain size and for a fully aligned composite consisting of Al2O3 rods in a stainless steel matrix. The microstructure in these multiphase alloys, each containing a brittle and ductile component, has a significant effect on the erosion behavior. In WC-Co alloys, the erosion rate vs angle of incidence curves change from a brittle to a ductile signature as the impacting abrasive particle size or particle velocity are increased using target samples with finer WC grain sizes. In the composite, the curves change from a ductile to a brittle signature as the particle size is increased. These effects are attributed to the change in scale of the impact damage event relative to the scale of the microstructure in WC-Co alloys. At small WC grain size, a constraint is imposed on the brittle fracture erosion process that occurs in the WC grains.

For the composite, the microstructural scale is always large and the behavior is due to the relative change in erosion rates for the two components without constraints due to the microstructural scale. DOE

N85-28979# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE EFFECT OF CENTER DELAMINATION ON THE INSTABILITY OF COMPOSITE CYLINDRICAL PANELS M.S. Thesis
Gary R. Seifert Dec. 1984 83 p
(AD-A153494; AFIT/GAE/AA/84D-25) Avail: NTIS HC A05/MF A01 CSCL 11/4

The buckling loads of 8-ply graphite-epoxy delaminated cylindrical panels were determined experimentally. The analysis included two different ply orientations, two different aspect ratios (length/chord), two different delamination sizes, and one set of boundary conditions; clamped along the top and bottom edges and simply supported along the vertical sides. The experimental test results were compared to the linear bifurcation loads obtained from the STAGSC-1 finite element computer code and the buckling loads of panels with square cutouts which were also obtained from STAGSC-1. The experimental testing was accomplished by the Air Force Flight Dynamics Laboratory. Experimental difficulties were encountered due to the inability of the test apparatus to evenly distribute the load through the simply supported boundary conditions. The uneven load distribution resulted in nonsymmetric buckling patterns, however, the buckling loads showed good correlation between analytical and experimental values. All experimental buckling loads were less than the analytical value predicted by STAGSC-1. The amount of decrease in load depended on ply orientation, aspect ratio, and delamination size. Author (GRA)

N85-28980# University Coll. of North Wales, Bangor. Dept. of Physics.
AN EVALUATION AND PREPARATION OF FERROMAGNETIC LIQUID COMPOSITES FOR USE AT MILLIMETER WAVELENGTHS Annual Technical Report, Oct. 1983 - Oct. 1984
J. Popplewell, K. OGrady, J. P. Llewellyn, and P. Davies Oct. 1984 68 p refs
(Contract DAJA45-83-C-0026; DA Proj. 1T1-61102-BH-57)
(AD-A153939; R/D-4130-R-MS; ATR-1) Avail: NTIS HC A04/MF A01 CSCL 20/3

Magnetic materials consisting of ferrofluids and ferrofluid composites i.e., mixtures of ferrofluid with metallic tin or non-metallic polystyrene or glass particles (0.2 micron to 25 micron diameter) have been prepared and studied. The samples in the form of thin films 1 to 10 micron thick have been examined using magnetic measurements and optical and microwave techniques. The measurements indicate that the films have: (1) a magnetic anisotropy with a 30% reduction in magnetization with the plane of the film perpendicular to the field direction (2) a birefringence at both optical and microwave frequencies. Particle conformations in the presence of a magnetic field have also been studied and related to theory which gives the effective diamagnetic magnetic moment/particle approx. = 10 to the minus 9th - 10 to the minus 10th power emu. GRA

N85-28981# Virginia Polytechnic Inst. and State Univ., Blacksburg. Materials Response Group.
APPLICATION OF LIGHTWEIGHT COMPOSITE MATERIALS TO NAVAL WEAPONS SYSTEMS Interim Report
Wayne W. Stinchcomb and Kenneth L. Reifsnider Feb. 1985 40 p Sponsored by Naval Ship Systems Engineering Station
(PB85-173607; VPI-E-85-7) Avail: NTIS HC A03/MF A01 CSCL 11D

A comprehensive study of the possibility that composite materials can be applied to Naval weapons systems was conducted. The particular system is a weapons elevator door. Specific attention is given to: (1) weight savings, (2) structural design, (3) shipboard requirements, and (4) component testing. Author (GRA)

N85-29100# Joint Publications Research Service, Arlington, Va.
LIGHTNING-SAFE CARBON FIBER COMPOSITE FOR AIRBUS TAIL UNIT
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 25-26 Repr. from Frankfurt. Zeitung/Blick Durch die Wirtschaft (Franfurt am Main), 1 Aug. 1984 p 6 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N85-28982* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CHEMICAL CONTROL OF NADIMIDE CURE TEMPERATURE AND RATE Patent
Richard W. Lauver, inventor (to NASA) Issued 30 Apr. 1985 9 p Filed 22 Jul. 1983 Division of US Patent Appl-SN-404809, filed 3 Aug. 1982, US Patent-4,455,418
(NASA-Case-LEW-13770-2; US-Patent-4,514,557; US-Patent-4,455,418; US-Patent-Appl-SN-516217; US-Patent-Appl-SN-404809; US-Patent-Class-528-342; US-Patent-Class-526-262; US-Patent-Class-528-322) Avail: US Patent and Trademark Office CSCL 07D

Polyimide resins suitable for use as composite matrix materials are formed by copolymerization of maleic and norbornenyl endcapped monomers and oligomers. The copolymers can be cured at temperatures under about 300 C by controlling the available concentration of the maleic end-capped reactant. This control can be achieved by adding sufficient amounts of said maleic reactant, or by chemical modification of either copolymer, so as to either increase Diels-Alder retrogression of the norbornenyl capped reactant and/or holding initiation and polymerization to a rate compatible with the availability of the maleic-capped reactant. Official Gazette of the U.S. Patent and Trademark Office

N85-28983*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUEL RICH CATALYTIC COMUSTION: THE FIRST STAGE OF A TWO-STAGE COMBUSTOR
Theodore A. Brabbs and Sandra L. Olson 1984 12 p refs Presented at Fall Meeting of the Eastern Sect. of the Combust. Inst., Clearwater Beach, Fla., 3-5 Dec. 1984
(NASA-TM-87042; E-2601; NAS 1.15:87042) Avail: NTIS HC A02/MF A01 CSCL 21B

An experimental program demonstrated that fuel-rich catalytic combustion can be accomplished soot free as long as the combustion temperature is less than the temperature at the rich limit of combustion. Although soot was not measured directly, three pieces of data strongly suggest that it was not present: (1) the product gases were completely transparent and produced no radiation characteristic of soot, (2) measured reaction temperatures followed closely those calculated for equilibrium with no soot present, and (3) over 99 percent of the carbon was accounted for in the measured reaction products. Data for two catalyst configurations were taken along with gas samples at two locations downstream of the catalyst bed. Author

N85-28984# State Univ. of New York, Stony Brook. Dept. of Chemistry.
LIGHT SCATTERING AND SPECTROSCOPIC STUDIES OF POLYMERIZATION PROCESSES Final Report, Feb. 1982 - 31 Jan. 1985
B. Chu 1 Mar. 1985 27 p refs
(Contract DAAG29-82-K-0044)
(AD-A153407; Rept-5010D; ARO-18675.8-CH) Avail: NTIS

HC A03/MF A01 CSCL 07/4

During the thermal polymerization of monomers such as methyl methacrylate (MMA) or styrene, we have been able to investigate both the static and the dynamic properties of the polymer formed, i.e., polymethyl methacrylate (PMMA) or polystyrene, in terms of the molecular weight, the second virial coefficient, the radius of gyration, the translational diffusion coefficient and its corresponding equivalent hydrodynamic radius as well as estimated of the size (or molecular weight) distribution of the polymer in dilute solution; and in terms of the isothermal compressibility, the cooperative diffusion coefficient and a slow characteristic decay time which has sometimes been related to the self-diffusion coefficient in the semidilute solution regime. By combining a spectroscopic technique, such as Raman scattering, which can determine the polymer concentration non-evasively during the polymerization process, with laser light scattering, we have demonstrated a viable procedure for on-line monitoring of solution polymerization processes permitting us to investigate detailed macromolecular properties in solution polymerization kinetics. The same approach has been extended to examine the thermal polymerization of melt hexachlorocyclotriphosphazine and of hexachlorocyclotriphosphazene in 1,2,4-trichlorobenzene to form poly(dichlorophosphazene). GRA

N85-28985# Utah Univ., Salt Lake City. Dept. of Chemistry.
THE CONVERSION OF SMALLER BORANE FRAGMENTS TO LARGER STRUCTURES. SYSTEMATICS OF BORON HYDRIDE REACTIONS Final Report, 19 Jun. 1981 - 31 Dec. 1984
Robert W. Parry and Goji Kodama 31 Dec. 1984 33 p refs
(Contracts DAAG29-81-K-0101; DAAG29-79-C-0129; Grant DAAG29-76-G-0120)
(AD-A153443; ARO-18151.14-CH) Avail: NTIS HC A03/MF A01 CSCL 07/2

The synthesis and reaction chemistry of B4H8 adducts of strong bases including trimethylphosphine, the boron framework expansion through the use of B2H4.2PMe3, the synthesis of polyboron cations including B3H6.2PMe3(*) and B4H7.2PMe3(+), and the coordinations chemistry of B2H4.2PMe3 are summarized. Described also are the synthesis of isomers of dichloroborylpentaborane(9), the reaction chemistry of B3H7PH3, anomalies in the reaction of B4H10 with bases, the deuteration of triborane adducts and the deprotonation of B5H9 with solid KOH. GRA

N85-28986# Purdue Univ., Lafayette, Ind. Div. of Sponsored Programs.
SUPER HYDRIDES Final Report, 1 Feb. 1982 - 31 Jan. 1985
Herbert C. Brown 7 Mar. 1985 22 p
(Contract DAAG29-82-K-0047)
(AD-A153499; ARO-18776.21-CH) Avail: NTIS HC A02/MF A01 CSCL 07/2

The unusual reactivity of lithium triethylborohydride (Super Hydride) encouraged us to examine the selective reduction properties of a number of new reducing agents. Just as the replacement of hydrogen atoms in lithium borohydride (LiBH4) with alkyl groups increases the reactivity of the reagent, substitution with alkoxy groups diminishes the reactivity. Thus, the trialkoxyborohydrides (K (RO)3BH) are very mild reducing agents. A series of potassium trialkoxyborohydrides were prepared in refluxing tetrahydrofuran from the trialkoxyborane and potassium hydride. In a similar fashion, a number of monoalkyldialkoxyborohydrides (KR (OR)2BH) were prepared from cyclic boronate esters and potassium hydride. We also discovered that potassium hydride reacts readily with a variety of B-alkoxy-9-BBN derivatives to afford the corresponding potassium dialkylalkoxyborohydrides (KR(OR)2BH). Thus we can now prepare the entire series of alkylalkoxyborohydrides: KR3BH, KR2(OR)BH, KR(OR)2BH and K(OR)3BH. Although the full potentialities of these reagents are yet to be explored, preliminary studies on the reduction of cyclic ketones have shown encouraging stereoselectivities. GRA

N85-28987# Minnesota Univ., Minneapolis. Dept. of Aeronautics and Engineering Mechanics.
THEORETICAL AND EXPERIMENTAL STUDIES OF THE MECHANICS OF VISCOELASTIC LIQUIDS Final Report, 10 Jan. 1982 - 9 Jan. 1985
D. D. Joseph and G. S. Beavers 15 Feb. 1985 37 p
(Contract DAAG29-82-K-0051)
(AD-A153505; ARO-18878.37-MA) Avail: NTIS HC A03/MF A01 CSCL 07/4

Theoretical and experimental studies of a wide range of problems in the rheometry of viscoelastic fluids are described. A device to measure the shear relaxation function has been invented (the wave speed meter). Investigations of the conditions under which the equations for the flow of viscoelastic liquids can change type have been carried out. The results from experiments and analyses on a variety of problems associated with bicomposed flows of liquids with different viscosities are presented. These included liquid rollers, the flow of two liquids in a pipe, and Taylor instability with two immiscible liquids. Analysis and experiments of the motion of a viscoelastic liquid between eccentric rotating cylinders are described. Some analytical results for the extrudate swell problem are presented. The climbing constants for a wide range of viscoelastic liquids have been measured. Other projects include stability analyses for several flow geometries; experiments on viscoelastic liquid breakup; and experiments on the stability of a rotating and coning cylinder. GRA

N85-28988# New Mexico Univ., Albuquerque.
RECYCLING AGENT SELECTION AND TENTATIVE SPECIFICATION Final Report, 10 Mar. 1982 - 31 Jul. 1984
B. M. Kiggundu, B. Nusser-Humphrey, and D. M. Zallen Mar. 1985 172 p
(Contract F29601-81-C-0013)
(AD-A153529; NMERI-TA5-15; AFESC/ESL-TR-84-47) Avail: NTIS HC A08/MF A01 CSCL 13/3

This report summarizes a 2 1/2 year research effort toward developing a procedure by which a standard laboratory can define appropriate modifiers to recycle old paving-grade asphalt in hot central plant-recycling operations. Literature reviews and discussions with expert asphalt chemists, technologists, research institutions, and oil companies were conducted. Field-aged asphalt cores from different climatic areas and modifiers were collected and characterized. Characterization using physical and chemical tests were performed on aged binders, modifiers, fresh and RTFO aged blends, and recovered recycled aged binders. Recycled Marshall mixtures were prepared and periodically characterized during accelerated oven aging. Chemical parameters identified were used to establish the laboratory test matrix. These parameters included the Polar/Saturate (P/S) ratio and percent generic aromatics as determined by a modified Clay-Gel (ASTM D2007) method. The results indicate that some chemical and physical properties can be correlated and that modifier/aged asphalt compatibility can be assessed by chemical methods developed in this study. Finally, a tentative recycling agent selection specification has been developed, but more research is required for validation. GRA

N85-28989# Naval Postgraduate School, Monterey, Calif.
HOLOGRAPHIC INVESTIGATION OF SOLID PROPELLANT COMBUSTION IN A TWO-DIMENSIONAL MOTOR M.S. Thesis
Y. Lee Sep. 1984 39 p
(AD-A153546) Avail: NTIS HC A03/MF A01 CSCL 21/2

This investigation continued the development of a method for obtaining high quality holograms of the combustion products from metallized solid rocket motor propellants burned in a two-dimensional motor to provide a cross-flow environment. The use of borosilicate side plates as a motor casting allowed good quality holograms to be obtained. With the present two-dimensional motor method there were upper limits of combustion pressure and weight percentage of aluminum where holograms could not be obtained because of excessive smoke opacity. GRA

N85-28990# Texas Univ., Austin. Dept. of Chemistry.
ELECTROGENERATED CHEMILUMINESCENCE Final Report, 15 Oct. 1981 - 14 Oct. 1984
A. J. Bard Dec. 1984 8 p
(Contract DAAG29-82-K-0006)

(AD-A153547; ARO-18404.6-CH) Avail: NTIS HC A02/MF A01 CSCL 07/4

Investigations of the chemiluminescent reactions of electrogenerated species (ecl) are summarized in the final technical report. We have become interested in polymer electrodes and in the possibility of studying electron-transfer reactions and ion transport in polymers by utilizing ecl techniques. We have recently reported the ecl of Ru(bpy)3 (2+) (bpy=2,2'-bipyridine) incorporated into a Nafion polymer film on an electrode surface. The electrochemical behavior and ecl of Ru(bpz) 2; (bpz-3(2+) (bpz=2,2'-bipyrazine) in acetonitrile solution have been investigated. Luminescence at Semiconductor Electrodes and Colloidal Dispersions are reported. Photoluminescence (pl) and photoinduced oxygen adsorption of colloidal zinc sulfide dispersions have been studied. Pl and electroluminescence (el) on ZnS single crystals and polycrystals doped with different impurities have been studied in various media (air, aqueous or nonaqueous solutions containing various redox couples). GRA

N85-28991# Pennsylvania Univ., Philadelphia. Dept. of Chemistry.

NEW SYNTHETIC ROUTES TO BORON CAGE COMPOUNDS Final Report, 16 Nov. 1981 - 15 Nov. 1984

L. G. Sneddon 10 Feb. 1985 5 p

(Contract DAAG29-82-K-0005)

(AD-A153554; ARO-18563.16-CH) Avail: NTIS HC A02/MF A01 CSCL 07/2

Polyhedral boron cage compounds have been recognized as having numerous potentially important practical applications due to their unique chemical and physical properties. Unfortunately this potential has been largely unrealized because of the non-selective, low yield synthetic methods required to obtain these compounds. The principle thrust of the work performed under ARO sponsorship was to investigate the fundamental processes involved in the formation of these types of compounds and to apply these techniques to the development of new high yield, two energy, selective synthetic routes. Our work has demonstrated: (1) new catalytic, high yield syntheses of alkenyl boranes and alkenyl carboranes, (2) the high yield thermally initiated conversion of alkenylpentaboranes into small cage carboranes, (3) new routes to large cage mono-carbon carboranes, (4) new catalytic routes to multi-cage compounds, and (4) the synthesis of a range of new hybrid cluster systems with unique structural properties. GRA

N85-28992# Mississippi Univ., University. Physical Acoustics Research Lab.

SOME AMPLIFICATION BY RELAXATION PROCESSES IN NITROGEN AND MIXTURES OF NITROGEN WITH HELIUM AND HYDROGEN Ph.D. Thesis

F. D. Shields and D. Iskandar 27 Mar. 1985 105 p

(Contract N00014-84-C-0193; DA Proj. RR0-1108)

(AD-A153620; PARGUM-85-01) Avail: NTIS HC A06/MF A01 CSCL 20/8

Experimental investigation of the sound amplification by relaxation processes in vibrationally excited gases has been made. Experiments were conducted in pure nitrogen and mixtures of nitrogen with helium and hydrogen. The nitrogen was vibrationally excited by an electrical discharge. A sound pulse, propagated through the excited gas under study, was Fourier analyzed to determine the absorption and velocity as a function of time and frequency. A numerical solution developed by Shields 22 was used to calculate the absorption and velocity in unexcited gases. The observed and calculated absorption and velocity were then compared to determine the gain and temperature of the gas. In pure nitrogen and mixtures of nitrogen and helium, in which the vibrational relaxation time was much longer than the sound period, gain was not observed. Gain was observed in three cases: 50% He - 50% N2 at 40 Torr, 10% H2 - 90% N2 at 40 and 20 Torr. In the first two mixtures it was possible to observe the change in gain with time as the vibrational temperature decayed away. GRA

N85-28993# University of Southern California, Los Angeles.

PREPARATION OF NITROCOMPOUNDS. Final Report, 15 Nov. 1981 - 14 Nov. 1984

G. A. Olah 29 Jan. 1985 6 p

(Contract DAAG29-82-K-0009)

(AD-A153687; ARO-18608.6-CH) Avail: NTIS HC A02/MF A01 CSCL 07/2

New methods for preparation of nitrocompounds were studied including nitration with nitric-fluorosulfuric acid, transfer nitrations with N-nitropyrazole and-imidazole, solid superacid (Nafion-H) catalyzed nitrations and reactions with nitronium salts. GRA

N85-28994# Ballistic Research Labs., Aberdeen Proving Ground, Md.

INVESTIGATION OF SEVERAL LOW-LYING LEVELS OF X DOUBLET PI STATE OF NCO USING ARGON LASER EXCITED FLUORESCENCE Final Technical Report

W. R. Anderson, A. J. Kotlar, J. A. Vanderhoff, and K. N. Wong Dec. 1984 31 p

(DA Proj. 1L1-61102-AH-43)

(AD-A153693; AD-F300592; BRL-TR-2625) Avail: NTIS HC A03/MF A01 CSCL 21/2

The laser excited fluorescence spectrum of NCO from an atmospheric pressure CH4/N2O/N2 flame is reinvestigated with a more sensitive apparatus than used previously. The NCO is pumped from the X doublet pi (1,O,O) level to the A doublet sigma plus (O,O,O) level. Emissions from the excited A state level to the following X state vibrational levels are observed: doublet pi (O,O,O), (1,0,0), and (O,O,1); doublet sigma plus (O,1,O). The previous tentative assignment of pumping transition as Q2(31) is confirmed. The confirmation of pumping transition solidifies our earlier interpretation that excited state spin relaxation in the flame is much faster than electronic quenching. In addition, analysis of the fluorescence spectra yields the first reported constants for the X doublet pi (1,O,O) level and spin splitting for the X doublet pi (O,O,1) level in the gas phase. GRA

N85-28995# United Technologies Research Center, East Hartford, Conn.

RESONANT CARS DETECTION OF OH RADICALS Final Report, 1 Aug. 1981 - 31 Dec. 1984

James F. Verdieck, Robert J. Hall, and Alan C. Eckbreth 31 Jan. 1985 48 p refs

(Contract F49620-81-C-0063)

(AD-A153842; UTRC/R85-955655; AFOSR-85-0385TR) Avail: NTIS HC A03/MF A01 CSCL 07/4

Under this AFOSR contract, resonant CARS (Coherent Anti-Stokes Raman Spectroscopy) of OH has been observed for the first time. Resonant CARS was achieved for several electronic transitions in the ultraviolet A--X bands of OH in a methane/oxygen flame. Saturation of the resonant CARS spectrum of OH was examined experimentally and definite evidence found, both in the intensity variation, and the number and shapes of the lines. Concurrently with the experimental studies, a good understanding of the theoretical aspects of the resonant CARS process has been secured, to the extent that predicted resonant CARS spectra can be computer synthesized and graphed for any selected frequency. A major departure from theoretical predictions was the experimental observation of satellite lines about the central line, not predicted from theory. At present, the cause of these extra resonances has not been determined, but their appearance may arise from saturation effects, or be caused by an undetermined nonlinear optical effect (such as dephasing-induced coherences). Another contributing factor may be rotational energy level transfer bought about by collision processes, occurring within the duration of the 10 nanosecond laser phase. GRA

N85-28996# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

ADIATATIC APPROACH IN THE THEORY OF POLYATOMIC PHOTODISSOCIATION: APPLICATION TO C2N2

W. A. Lester, Jr., V. Z. Kresin, and C. E. Dateo Nov. 1984 11 p refs Presented at the Intern. Conf. on Lasers, San Francisco, 26-30 Nov. 1984

(Contract DE-AC03-76SF-00098)

(DE85-008515; LBL-18651; CONF-8411153-3) Avail: NTIS HC A02/MF A01

An adiabatic method for nuclear motion has been developed and applied to single-photon predissociation of C2N2. The theoretical predictions are in good accord with recent measured product energy distributions. DOE

N85-28997# National Bureau of Standards, Gaithersburg, Md. Center for Analytical Chemistry.

PRINCIPLES OF QUALITY ASSURANCE OF CHEMICAL MEASUREMENTS

John K. Taylor Feb. 1985 81 p refs

(PB85-177947; NBSIR-85/3105) Avail: NTIS HC A05/MF A01 CSCL 07D

The principles of quality assurance of chemical measurements are discussed. They may be classified as quality control - what is done to control the quality of the measurement process, and quality assessment - what is done to evaluate the quality of the data output. Quality assurance practices are considered as a hierarchy with levels progressing from the analyst, the laboratory, the project, to the program. The activities of each level are different and depend upon the ones beneath it. Recommendations are presented for developing credible quality assurance practices at each level. An appendix contains outlines that may be used to develop the various documents associated with a quality assurance program. Author (GRA)

N85-28998# Minnesota Univ., Minneapolis. Dept. of Chemical Engineering and Materials Science.

CONTINOUS CHEMICAL REACTION CHROMATOGRAPHY Progress Report, Nov. 1983 - Feb. 1985

R. Aris and R. W. Carr, Jr. 1985 37 p refs

(Contract DE-FG02-84ER-13256)

(DE85-009812; DOE/ER-13256/1) Avail: NTIS HC A03/MF A01

The following projects were completed: (1) countercurrent moving bed reactor (CCMBR) theory; (2) countercurrent moving bed reactor experiments; and (3) countercurrent moving bed adsorber (CCMBA). Some of the highlights are as follows: (1) mathematical analyses of the CCMBR show that for both the ideal reactor model and for the reactor with finite dispersion and finite adsorption rate, appropriate operating conditions for A = B lead to simultaneous reaction and separation; (2) comparison of the CCMBR with the performance of a fixed bed shows that the latter can be exceeded in both yield and product purity; (3) experimental investigations of the hydrogenation of mesitylene in the laboratory scale CCMBR was completed, and the results were described in a manuscript; and (4) an ideal model of the CCMBA was completed. Current work on the simulated CCMBR is described covering general considerations, general equations of the system, further considerations, and qualitative aspects of experimental design. DOE

N85-28999# Texas Univ., Austin.

STUDY OF SYNTHESIS GAS CONVERSION OVER METAL OXIDES Progress Report, 1 Aug. 1985 - 31 Jul. 1985

John G. Ekerdt 1985 16 p refs

(Contract DE-AS05-80ER-10720)

(DE85-010136; DOE/ER-10720/16) Avail: NTIS HC A02/MF A01

The reaction intermediates present during CO hydrogenation over metal oxides were identified the reaction mechanisms, and the active site and how the metal cations and lattice oxygens participate in the CO hydrogenation reactions were determined. Zirconium dioxide was studied because it catalyzes the formation of aromatics and highly branched alkanes in a process referred to as isosynthesis. The atmospheric work concentrated on methanol synthesis mechanisms and surface reactions. The high pressure work was directed toward an identification of the carbon-carbon chain growth step during isosynthesis. The process whereby methanol was formed was investigated. The role of water in methanol formation was addressed using oxygen-18 labeled H2O and CO. These labeling provided insight into the manner by which formate is formed at a ZrO2 surface. The high pressure studies are not as conclusive as the atmospheric studies. Earlier work revealed that C4 products are formed in a step-wise fashion between a C1 and a C3 species and revealed that isobutene and 1-butene are the primary products at low conversion and a pressure of 35 atm and that these primary products are most likely formed from a common intermediate. DOE

N85-29000# Mannesmann Forschungsinst. G.m.b.H., Duisburg (West Germany).

DETECTION OF PORES IN HOT CONTINUOUSLY CAST ROUNDS Final Report, Nov. 1983

Hans Schrewe (Mannesmann Roehrenwerke A.G., Huettenwerke Huekinge, West Germany) and Gerd-Joachim Deppe Bonn Bundesministerium fuer Forschung und Technologie Jan. 1985 24 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-T-85-007; ISSN-0340-7608) Avail: NTIS HC A02/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 5

An automatic method to detect pores in hot continuously cast rounds was developed. The flame-scarfing technology was improved to prepare the surface of the rounds to meet the inspection requirements. A matched sensor technique yielding a picture of the scarfing spot which is rich in contrast was developed. After optimization of the characteristic data of flame scarfing, an apparatus was designed and built. A television tube with adapted filtering displays the scarfing spot. During the project, the appearance of the flaws changed. On the basis of the recorded pores the requirements for the evaluation system were derived, but realization was stopped because of the changed appearance of the flaws. The investigations allow further developments of automatic pore detection. Author (ESA)

N85-29001# National Center for Atmospheric Research, Boulder, Colo.

CHEMICAL TRANSFORMATION MODULES FOR EULERIAN ACID DEPOSITION MODELS. VOLUME 1: THE GAS-PHASE CHEMISTRY Interim Report, Aug. 1983 - Jul. 1984

J. A. Kerr and J. G. Calvert Feb. 1985 258 p refs

(PB85-173714; EPA-600/3-85-015-Vol-1) Avail: NTIS HC A12/MF A01 CSCL 07D

Mechanistic and kinetic data for the gas phase reactions that lead to the production of acidic substances in the environment were studied. A master mechanism is designed that treats oxides, sulfur dioxide, ozone, hydrogen peroxide, ammonia, the simple amines, chlorine, hydrogen sulfide, dimethyl sulfide, the hydrocarbons, and the variety of oxidation products of these species including the transient free radicals, aldehydes, ketones, hydroperoxides and other molecules. The reaction mechanisms and the rate constants for certain of the chemical transformations are identified for which major uncertainties remain. GRA

N85-29002# National Bureau of Standards, Gaithersburg, Md. Chemical Thermodynamics Div.

GAMPHI: A DATABASE OF ACTIVITY AND OSMOTIC COEFFICIENTS FOR AQUEOUS ELECTROLYTE SOLUTIONS Final Report

R. N. Goldberg, J. L. Manley, and R. L. Nuttall Mar. 1985 28 p refs Sponsored by DOE

(PB85-183390; NBS/TN-1206) Avail: NTIS HC A03/MF A01; SOD HC $1.25 as 003-003-02640-9 CSCL 07D

A database of activity and osmotic coefficients for 350 binary aqueous electrolyte solutions at 298.15 K was assembled together with a collection of subroutines for utilizing the database. The computer codes, which are written in FORTRAN77, can be used either interactively or from user-written programs to calculate values of the activity and osmotic coefficients at selected molalities. GRA

N85-29003# Nebraska Univ., Omaha.

COADSORPTION STUDIES ON TRANSITION METALS Annual Report, Jan. - Dec. 1984

J. H. Craig, Jr. Mar. 1985 18 p

(PB85-183713; GRI-85/0036) Avail: NTIS HC A02/MF A01

CSCL 07D

Surface mass spectroscopy was used to study adsorption and coadsorption of active gases on several transition metals. Electron and ion stimulated desorption techniques were employed in conjunction with thermal desorption spectroscopy. Results are reported on the following experiments: (1) oxidation of CO to CO2 on rhodium; (2) adsorption of CO on palladium; (3) adsorption of hydrogen on palladium; and (4) coadsorption of H2 and CO on palladium. GRA

N85-29004# Illinois Univ., Urbana-Champaign. Dept. of Aeronautical and Astronautical Engineering.
FLAME ACCELERATION MECHANISMS UNDER CONDITIONS OF PARTIAL CONFINEMENT Final Report, Feb. 1983 - Aug. 1984
R. A. Strehlow, A. I. Ormsbee, T. W. G. Yip, and S. H. Reichenbach Sep. 1984 132 p refs Sponsored by Gas Research Inst.
(PB85-184083; GRI-84/0209) Avail: NTIS HC A07/MF A01 CSCL 21B

A technique has been developed to quantify the violence of the interaction of a flame with a vortex in the flow. The vortex was generated in the wake of a corner or at the trailing edge of a plate by causing a premixed flame to act as a piston in a channel. When the flame exited the channel, it immediately interacted with the vortex. The apparatus has cylindrical symmetry and the output of sensitive pressure transducers was used with acoustic monopole theory to determine the violence of the flame vortex interaction process as a function of channel dimensions and normal burning velocity of the combustible mixtures. The violence of the interaction was analyzed in terms of the calculated vorticity Reynolds number of the vortex. A shock tube was used to generate vortices and observe the breakdown process. GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N85-29005* National Aeronautics and Space Administration. Pasadena Office, Calif.
CORROSION RESISTANT COATING Patent
Satish K. Khanna (JPL, Pasadena, Calif.), Anilkumar P. Thakoor (JPL, Pasadena, Calif.), and Roger M. Williams, inventors (to NASA) (JPL, Pasadena, Calif.) Issued 11 Jun. 1985 8 p Filed 30 Sep. 1983 Sponsored by NASA
(NASA-Case-NPO-15928-1; US-Patent-4,522,844; US-Patent-Appl-SN-537616; US-Patent-Class-427-38; US-Patent-Class-427-47; US-Patent-Class-204-192N) Avail: US Patent and Trademark Office CSCL 11F

A method of coating a substrate with an amorphous metal is described. A solid piece of the metal is bombarded with ions of an inert gas in the presence of a magnetic field to provide a vapor of the metal which is deposited on the substrate at a sufficiently low gas pressure so that there is formed on the substrate a thin, uniformly thick, essentially pinhole-free film of the metal.
Official Gazette of the U.S. Patent and Trademark Office

N85-29006 Metals Society, London (England).
TENDENCY OF SELECTED LOW-CARBON STEELS TO CORROSION CRACKING IN NITRATES
Nov. 1984 20 p refs Transl. into ENGLISH from Hutn. Listy (Czechoslovakia), no. 12 1982, p 862-867
(BLL-BISI-Trans-22262-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

A tendency to corrosion cracking in nitrates for low killed aluminum killed, and titanium plus manganese killed steel is described. The first of these steels is very resistant, the second resistant, and the latter not resistant at high heat, and especially at weld locations. While normally highly resistant to corrosion cracking in nitrates, the latter unsatisfactory results can be corrected by annealing at 750 C. Notch toughness versus test temperature curves for several kinds of heat treatment is also given with generally unfavorable results. F.M.R.

N85-29007 Metals Society, London (England).
VARIATIONS IN THE STRUCTURE AND IN THE COMPOSITION OF AUSTENTIC AND CARBON STEEL IN SPOT WELDS
V. Masarik Nov. 1984 15 p refs Transl. into ENGLISH from Koroz. Ochr. Mater. (Czechoslovakia), v. 1, 1982 p 6-10
(BLL-BISI-Trans-21765-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £14.25; overseas $33.75

Variations in the structure and composition of austenitic and carbon steel in spot welds were evaluated to underline the need for high-quality weldings. Excessive melting of the joint must be avoided, the etching depth of grain boundaries by pickling can also affect corrosion resistance. E.A.K.

N85-29008 Metals Society, London (England).
UNALLOYED AND ALLOYED LINE WIRES OF IMPROVED PROPERTIES
I. Bartak Nov. 1984 19 p refs Transl. into ENGLISH from Banyas Kohasz Lapok (Kohasz) (Hungary), no. 115, 7/8, 1982 p 362-367
(BLL-BISI-Trans-21930-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.

Significant practical knowledge and experience were accumulated in the production of the base materials for aluminium wire lines at the Aluminium Furnaces of Inota, resulting, together with research activities, in an improvement in quality. The works development program anticipated the need for great quantities of alloyed and unalloyed line wires. The products are prepared by the latest techniques meet the strictest international specification standards. Author

N85-29009*# National Aeronautics and Space Administration, Washington, D. C.
ELECTRICAL CONDUCTIVITY AND PHASE DIAGRAM OF BINARY ALLOYS. 21: THE SYSTEM PALLADIUM-CHROMIUM
G. Grube and R. Knabe May 1985 27 p refs Transl. into ENGLISH from Z. fuer Elektrochem. (West Germany), v. 42, no. 11, 1936 p 793-804 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-4005)
(NASA-TM-77863; NAS 1.15:77863) Avail: NTIS HC A03/MF A01 CSCL 11F

Pd-Cr alloys were investigated by thermal analysis, hardness measurements, X-ray analysis, microscopic examination of etched pieces, and temperature-resistance curves of the solid alloys. Only one compound, Pd2Cr3, m, 1389 deg, is formed. It possesses a cubic face centered lattice and forms with excess Pd a series of solid solutions with a minimum m.p. at 45 atoms% Pd. Hardness maximum appears at the Pd2Cr3 point. Pd2Cr3 forms no solid solutions with Cr but eutectic point appears at 25 atoms% Pd, m. 1320 deg. The sp. resistance of pure Cr in an atom of H, indicates no allotropic forms. Cr2O3 is solid in molten Cr. Pure Cr melts at 1890 plus or minus 10 deg but Cr contg. Cr2O3 starts to melt at 1770 to 1790 deg. R.J.E.

N85-29010# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
SOL-GEL PROCESSING OF LEAD ZIRCONATE TITANATE FILMS
R. A. Lipeles, N. A. Ives, and M. S. Leung 1 May 1985 20 p refs
(ATR-85(8343)-2) Avail: NTIS HC A03/MF A01

Lead zirconate titanate films were made from lead acetate, zirconium n-tetraproproxide, and titanium n-tetrabutoxide starting materials in methanol. The pyrolysis of the precursor gel was studied using thermogravimetric analysis, Fourier transform infrared spectroscopy and X-ray powder diffraction. The results of these measurements show that lead oxide and mixed phase PZT form at temperatures below 450 C, and higher temperatures are required in order to obtain a perovskite oxide. Films prepared on stainless steel and annealed at 600 C showed growth of a lead

chromate phase and a perovskite PZT phase during annealing. The distribution of chromium in the film was measured using Auger Electron Spectroscopy and ion sputter profiling. Based on the results, chromium diffusion in PZT films on stainless steel can be minimized by annealing at temperatures below 550 C. Author

N85-29011# Naval Research Lab., Washington, D. C.
LOCALIZED IONIC CURRENTS FROM A CORRODING IRON-COPPER GALVANIC COUPLE Progress Report, Jan. - Jul. 1984
C. R. Crowe 18 Apr. 1985 23 p
(DA Proj. RR0-2208)
(AD-A153627; NRL-MR-5416) Avail: NTIS HC A02/MF A01 CSCL 07/4

In this report, progress in the application and development of scanning vibrating electrode techniques (SVET) for electrochemical measurements needed to test finite element models is presented. The test system is an iron-copper galvanic couple in which SVET have been used to measure local ionic currents in solution with spatial and current resolutions of the order of 15 to 20 micron and 5nA/sq cm, respectively. Thus, it is possible to measure corrosion currents resulting from individual local cell activity on a scale sufficient to test finite element models for accuracy. The report covers: (1) a review of the state-of-the-art of scanning vibrating probe techniques, (2) an experimental evaluation of the one-dimensional probe technique as applied to planar galvanic couple between iron and copper, and (3) a discussion of the development of a three-dimensional probe to advance the state-of-the-art. Based on the completed experimental electric field scans and the corresponding finite element field prediction, it appears that the finite element technique presents a strong analytical tool for calculating the near field distributions about active electrodes surfaces in homogeneous media. GRA

N85-29012# Naval Research Lab., Washington, D. C. Environmental Effects Branch.
MARINE CORROSION Final Report
A. J. Sedriks 24 Apr. 1985 25 p refs
(AD-A153843; NRL-MR-5527) Avail: NTIS HC A02/MF A01 CSCL 11/6

This report is a review of marine corrosion of metals and alloys which is to be included in the new Handbook of Ocean Engineering, to be published by Academic Press in 1985. The report describes marine environments, the types of marine corrosion encountered, cathodic protection and alloys used in marine applications. Emphasis is placed on describing the types of corrosion generally found and the preventative measures employed. GRA

N85-29013# California Univ., Berkeley. Lawrence Berkeley Lab.
STRENGTH VERSUS TOUGHNESS RELATION IN Fe-HIGH MANGANESE ALLOYS
Y. Tomota and J. W. Morris, Jr. Apr. 1984 7 p refs Presented at the 107th Iron and Steel Inst. of Japan Meeting, Narashino, Japan, 1 Apr. 1984
(Contract DE-AC03-76SF-00098)
(DE85-007682; LBL-18892; CONF-8404235-1) Avail: NTIS HC A02/MF A01

Charpy impact tests were performed on the 16 to 36 wt % Mn steels whose tensile properties have already been reported. The effect of Mn content on the ductile-brittle transition behavior was basically identical with other workers' results. However, since the reasons for these phenomena are quite unclear, advanced experimental facts are discussed. DOE

N85-29014# Hanford Engineering Development Lab., Richland, Wash.
DEVELOPMENT OF REDUCED ACTIVATION ALLOYS FOR FUSION SERVICE: DRAFT
H. R. Brager, F. A. Garner, D. S. Gelles, and M. I. Hamilton 1984 13 p refs Presented at the 1st Intern. Conf. on Fusion Reactor Mater., Tokyo, 3-6 Dec. 1984
(Contract DE-AC06-76FR-02170)
(DE85-007464; HEDL-SA-3181-FP-Draft; CONF-841246-20-Draft) Avail: NTIS HC A02/MF A01

The development of low activation alloys is one of the goals of the materials program of the US Magnetic Fusion Energy Program. Irradiation of two series of such alloys has commenced in FFTF. One series is based on austenitic steels with manganese substituting for nickel, and the other is based on ferritic steels with vanadium and/or tungsten substituting for molybdenum and niobium. In addition to the irradiation experiments, parallel studies on corrosion resistance in flowing lithium, perirradiation ductility and thermal stability are also in progress. The results of irradiation at 420, 500 and 600 C to 15 dpa and also the early results of the ex-reactor studies are reviewed. DOE

N85-29015# Connecticut Univ., Storrs. Dept. of Metallurgy.
FATIGUE AND CHROMIUM-FERRITIC STEELS AT ELEVATED TEMPERATURES Final Report, 1 Jul. 1982 - 30 Jun. 1984
A. J. McEvily 1984 26 p refs
(Contract DE-AC02-82ER-12065)
(DE85-007735; DOE/ER-12065/1) Avail: NTIS HC A03/MF A01

The fatigue crack growth characteristics of ferritic steels 2 1/4Cr-1Mo, modified 9Cr-1Mo, and 9Cr-2Mo steels have been investigated at 538 C in vacuum and compared to results obtained at room temperature. Despite marked differences in initial mechanical properties the fatigue crack growth behavior at 538 C was remarkably similar. Further crack closure was greatly reduced at the elevated temperature leading to a loss of R-dependency on crack growth. Results of room in elevated temperature tests could be correlated by means of the change in Young's modulus. Additional studies of its effect of processing and electron beam welding on low-cycle fatigue properties have also been investigated. Work on creep crack growth of ferritic steels has been initiated. DOE

N85-29016# California Univ., Berkeley. Lawrence Berkeley Lab.
ELEVATED TEMPERATURE EROSION CORROSION OF 9Cr1Mo STEEL
A. V. Levy and Y. F. Man Jan. 1984 35 p refs Presented at Am. Inst. of Mining, Metal. and Petroleum Engr. Conf., Detroit, 17 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE85-008445; LBL-18254; CONF-8409179-6) Avail: NTIS HC A03/MF A01

The combined erosion-corrosion behavior of 9Cr1Mo steel was determined at 850(0)C using a blast of air and 130(MU) m dia Al2O3 particles from a nozzle at a number of velocities from 10 to 70 m/s. The mechanism of surface degradation and the rates of sound metal loss were determined. Corrosion occurred at all velocities tested. It was established that the sound metal loss increased with increasing velocity and that there was a change in the loss mechanism at about 30 m/s. Below this velocity, scale loss occurred by an erosion enhanced corrosion mechanism. Above 30 m/s the impacting particles consolidated and densified the scale, eliminating the micro-cracks that occurred at the lower velocities. Elimination of the micro-cracks increased the stresses in the scale, resulting in periodic spalling of larger pieces of scale. The spalling increased the sound metal loss rates at the higher velocities, resulting in a classic transition rate S curve. DOE

N85-29017# California Univ., Berkeley. Lawrence Berkeley Lab.
SURFACE DEGRADATION OF DUCTILE METAL IN ELEVATED TEMPERATURE GAS-PARTICLE STREAMS
A. V. Levy and Y. F. Man Jan. 1985 35 p refs Presented at 30th Intern. Gas Turbine Conf. and Exhibit, Houston, Tex., 18 Mar. 1985
(Contract DE-AC03-76SF-00098)
(DE85-008428; LBL-18686; CONF-850351-4) Avail: NTIS HC A03/MF A01

The mechanisms and rates of erosion and combined erosion corrosion of 9Cr1Mo steel and 210SS at elevated temperatures were investigated. Tests were performeed in a partially inert gas atmosphere to study erosion behavior and in an air atmosphere to study combined erosion corrosion behavior. It was determined

that the erosion rate remained constant or decreased with temperature in nitrogen until a temperature was reached at which the tensile strength vs temperature curve of the alloy markedly changed its negative slope. Above this temperature the erosion rate increased rapidly with temperature. In an erosion corrosion environment corrosion was the dominant mechanism at all test conditions. At higher temperatures and velocities the material loss mechanism changed from low rate chipping of the scale to high loss rate periodic spalling. The continuous scale formed on 9Cr1Mo steel in air appeared to protect the metal surface, decreasing its loss rate in (ALPHA)=30(0) test compared to that of 210SS tested at the same conditions in nitrogen where a continuous scale did not form. DOE

N85-29018# California Univ., Berkeley. Lawrence Berkeley Lab.
ELEVATED TEMPERATURE EROSION OF STEELS
A. V. Levy, J. Yan, and J. Patterson 14 Apr. 1985 45 p refs Presented at 4th Intern. Conf. on Wear of Mater., Vancouver, 14 Apr. 1985
(Contract DE-AC03-76SF-00098)
(DE85-008503; LBL-18256; CONF-850415-3) Avail: NTIS HC A03/MF A01

The elevated temperature erosion behavior of several commercial, ferritic and austenitic steels was determined over a range of temperatures from room temperature to 900(0)C. It was determined that all of the steels had constant or decreasing erosion rates as the test temperature was increased until a temperature was reached where a marked increase in erosion rate began to occur with temperature. Austenitic steels were determined to have lower erosion rates than ferritic steels and hardness had no correlation with erosion rate. All of the steels tested eroded by the platelet mechanism of erosion. DOE

N85-29019# Oak Ridge National Lab., Tenn.
INTERFACIAL SEGREGATION AND FRACTURE
M. H. Yoo, C. L. White, and H. Trinkaus Mar. 1985 55 p refs Presented at the ASM Mater. Sci. Seminar on Flow and Fracture at Elevated Temp., Philadelphia, 1-2 Oct. 1983
(Contract DE-AC05-84OR-21400)
(DE85-009779; ORNL/TM-9016) Avail: NTIS HC A04/MF A01

The physical mechanisms that control nucleation, growth, and coalescence of intergranular cavities during deformation of polycrystalline materials at intermediate temperatures under low applied stress were required. The effects of interfacial solute segregation on creep ductility are discussed for its effects on interfacial energies and diffusivities. The available experimental data on detrimental and beneficial solute effects on creep rupture life of model alloy systems are consistent with the calculated time to rupture. A limited understanding of ther grain-boundary chemistry effects on creep enbrittlement of commercial structural alloys is presented. DOE

N85-29020# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
STRAIN FIELDS FOR ALUMINUM AT DIFFERENT TOOLING TEMPERATURES AND EXTRUSION RATIOS
H. B. Peacock and D. G. Berghaus Mar. 1985 21 p refs Presented at the 9th Conf. on Advan. in the Prod. of Tubes, Bars and Shapes, Cincinnati, 22-24 Apr. 1985
(Contract DE-AC09-76SR-00001)
(DE85-008257; DP-MS-85-10; CONF-850499-1) Avail: NTIS HC A02/MF A01

Strain distributions throughout the die region are obtained for axisymmetric extrusion of aluminum billets. Results which include the three extensional strains and accumulated shear are produced from an analysis of experimentally obtained laminar flow lines on extruded specimens. Extrusion experiments are performed at average tooling temperatures of 174 C and 354 C and for extrusion ratios from 1.9 to 12.4. Both tooling temperatures and extrusion ratios affect the magnitude and/or the distribution of plastic strains in extruded aluminum. DOE

N85-29021# Northwestern Univ., Evanston, Ill. Dept. of Physics and Astronomy.
LOCAL DENSITY THEORY OF HEATS OF FORMATION AND SHORT-RANGE ORDER PARAMETERS IN SUBSTITUTIONALLY DISORDERED ALLOYS Annual Report
A. J. Freeman and A. Gonis 1985 4 p
(Contract DE-FG02-84ER-45080)
(DE85-009811; DOE/ER-45080/T1; AR-1) Avail: NTIS HC A02/MF A01

The objective was to calculate short-range-order effects and phase diagrams in substitutionally disordered alloys of transition metals and actinides. During this period, a general unified method was formulated for calculating the Green functions associated with atoms in crystalline matter displaced from the regular lattice positions. DOE

N85-29022# Minnesota Univ., Minneapolis. Corrosion Research Center.
CORROSION RESEARCH CENTER OF THE UNIVERSITY OF MINNESOTA Progress Report, 1 Jan. - 31 Dec. 1984
R. A. Oriani Feb. 1985 219 p refs
(Contract DE-FG02-84ER-45173)
(DE85-009418; DOE/ER-45173/1) Avail: NTIS MF A01

The research is reported in two parts: (1) surface structures and reactions in aqueous corrosion systems, and (2) role of oxide scale morphology and structure on high temperature oxidation and corrosion processes. In part one, the research is further broken down into these areas: reactions and structures at electrolyte interfaces with metals and semiconductors; formation and breakdown of protective films on corroding surfaces; and theoretical studies of structure and reaction in corrosion. In part two, the research breaks down into the development of stresses and cracking in oxide scales and complex scales and scaling processes. E.R.

N85-29023# Bendix Corp., Kansas City, Mo.
AGING STUDY OF COPPER ALLOY 172 Final Report
M. G. Ulitchny, F. E. Lormis, G. D. Swanson, and C. E. Watterson Apr. 1985 13 p refs
(Contract DE-AC04-76DP-00613)
(DE85-009848; BDX-613-3227) Avail: NTIS HC A02/MF A01

An evaluation of the effects of aging temperature on the yield strength and toughness of beryllium copper alloy 172 shows that all the toughness measurements, impact energy, precracked Charpy, and compact tension parallel each other and mirror the tensile strength. An aging schedule which is improved from that currently prescribed was determined in order to produce an improved combination of strength toughness. A study of the surface wave velocity as a function of aging temperature has revealed an easy way to determine under aging or over aging in this alloy. DOE

N85-29024# General Electric Co., Schenectady, N. Y. Advanced Nuclear Technology Operation.
PRELIMINARY RESULTS OF THE INCONEL 617 OPTIMIZATION PROGRAM. ADVANCED GAS COOLED REACTOR MATERIALS PROGRAM
O. F. Kimball Aug. 1984 85 p refs
(Contract DE-AC03-80ET-34034)
(DE85-008235; DOE/ET-34034/110) Avail: NTIS HC A05/MF A01

This report describes the progress in the Advanced Gas Cooled Reactor Materials program to improve the thermal stability of Inconel 617, a top candidate alloy for a Nuclear Process Heat (NPH) steam reformer. The effect of exposures at the temperatures expected for the NPH steam reformer on the room temperature toughness (impact energy and tensile ductility) and tensile strength are presented. Changes in the microstructures of the exposed specimens and the relationship between microstructural and mechanical property changes are discussed. In addition, details of the microstructural changes that are necessary for understanding the mechanisms of the thermal instability for this alloy also are included. Methods of improving the thermal stability of Inconel 617 are suggested based on the detailed microstructural changes that occur due to elevated temperature exposures. A heat treatment

method for improvement of thermal stability, which has given some very encouraging preliminary results, is presented. DOE

N85-29025# Los Alamos Scientific Lab., N. Mex.
SINTERING REACTIONS, STRUCTURE AND PROPERTIES OF A COBALT FREE NONCONVENTIONAL HARD MATERIAL
H. Steinberg 1985 21 p refs Presented at 11th Plainsee Seminar, Reutte, Austria, 20 May 1985
(Contract W-7405-eng-36)
(DE85-007704; LA-UR-85-467; CONF-8505114-1) Avail: NTIS HC A02/MF A01

The compositional range of the metal boron-carbon family of hard metals was extended to yield the wide density range of approx. 7.8 to 17.1 Mg/cu cm with only a small spread in hardness values. The abrasion resistance and fracture toughness of several compositions were in the range of some commercial grades of wear resistant tungsten carbide-cobalt hard metals. Hot microhardness of one composition was 10 to 20% higher than any premium grade conventional tungsten carbide-cobalt. A 95.0 wt % W-3.5 wt % Ni-1.5 wt % Fe composition blended with 2.5 wt % b4C or B was pressed and sintered at temperatures between 800 and 1460 C; metallographic examination indicated onset of reactions at 900 C with B4C and at 1000 C with B and no unreacted B4C or B at 1100 C. Specimens of Mo-Ni-Fe-B4C and W-Ni-Fe-B4C hot pressed at 1460 C were examined by scanning electron microscopy coupled with X-ray analysis; analysis indicated formation of principally MoC or WC with secondary phases of borocarbides and borides. DOE

N85-29026# Pennsylvania State Univ., University Park. Dept. of Materials Science and Engineering.
HYDROGEN ABSORPTION IN METALS: A FIELD ION MICROSCOPY STUDY Final Report, 1 Jun. 1981 - 31 Dec. 1984
H. W. Pickering Mar. 1985 87 p refs
(Contract DE-AC02-79ER-10430)
(DE85-010299; DOE/ER-10430/T2) Avail: NTIS HC A05/MF A01

The high performance atom probe was constructed and satisfactory performance was obtained with a mass resolution of m/(DELTA)m approx. 1000 and the detection efficiency close to the theoretical upper limit. In the case of Fe-Ti alloys, surface segregation of Ti was documented and internal and external oxidation of this binary alloy depending upon O2 partial pressure was observed. A Fe-0.04% P alloy was studied to observe grain boundary, segregation of P at high temperatures. Phosphorus, however, is not found in the carbide precipitate, presumably rejected during its formation. Another new observation is that surface segregation exhibits cross over in Cu-Ni alloys at 16% Ni concentrations. DOE

N85-29027# California Univ., Livermore. Lawrence Livermore Lab.
EVALUATION OF 7XXX-SERIES ALUMINUM ALLOYS FOR THE W87 AFT SUPPORT RING
K. W. Mahin 1 Mar. 1985 59 p refs
(Contract W-7405-eng-48)
(DE85-009987; UCID-20329) Avail: NTIS HC A04/MF A01

The tensile properties of both 7075-T6 and 7050-T73651 decreased significantly after holding the alloys for any length of time at temperatures greater than 500 F. After a 2-min hold at 575 F, the yield strengths of 7075-T6 and 7050-T73651 were 217 MPa (31.5 ksi) and 245 MPa (35.6 ksi), respectively. There did not appear to be a significant difference in the mechanical properties between 7075-T6 and 7050-T6. Time at temperature appeared to be a critical parameter. Cycling the microstructure to 575 F or above with no hold at temperature caused considerably less degradation in mechanical properties than a 2-min hold at temperature in all cases. Above 650 F, both the ultimate tensile strength and the yield strength of the alloys reached a minimum of around 310 MPa (45 ksi) and 138 MPa (20 ksi), respectively. Evidence of a continuous grain boundary film of eta phase precipitates was found in the 7075-T6 alloy after a typical 575 F thermal cycle. The presence of this grain boundary precipitate indicated a potential sensitivity of this alloy to stress corrosion cracking. DOE

N85-29028# Pacific Northwest Lab., Richland, Wash.
CRACK TIP CHEMISTRY MODELING OF INTERGRANULAR STRESS CORROSION CRACKS OF NICKEL CONTAINING SEGREGATED PHOSPHORUS AND SULPHUR
M. J. Danielson, C. A. Oster, and R. H. Jones Nov. 1984 44 p refs Presented at the Intern. Meeting on Corrosion Chem. within Pits, Crevices and Cracks, Teddington, England, 1-4 Oct. 1984
(Contract DE-AC06-76RL-01830)
(DE85-010059; PNL-SA-12315; CONF-8410207-2) Avail: NTIS HC A03/MF A01

The effect of P and S on the intergranular corrosion and stress corrosion of Ni was evaluated with corrosion tests, crack tip corrosion modeling and stress corrosion tests. Tests were conducted in 1N H2SO4 at 25 C over anodic potentials of + or - 0.3V to 2.OV (SEC). A one-dimensional mass transport model was developed to predict the corrosion rates at the tip and crack walls. Corrosion tests were conducted on Ni + P and Ni + S alloys and Ni samples ion implanted with P and S to develop a data base for the model. It is shown that both P and S reduce passivity in Ni and enhance the corrosion rate but that P is oxidized and dissolves in the electrolyte while S remains on the surface. The model predicts that the active tip and crack walls with Ni + S will result in precipitation of NiSO4 at very shallow crack depths and extremely low crack tip corrosion rates. Both IGC and IDCC are essentially absent from the Ni + S system at 900 mV (SEC). The model predicts much larger crack tip corrosion rates for the Ni + P system with an active tip and passive walls. DOE

N85-29029# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CORROSION-EROSION RATES/MECHANISMS OF 9Cr1Mo STEEL
Alan V. Levy and Yong-Fa Man Jan. 1985 36 p refs Presented at the Corrosion 85 Conf., Boston, 25-29 Mar 1985 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE85-008506; LBL-17911; CONF-850311-11) Avail: NTIS HC A03/MF A01

The combustion erosion corrosion behavior of 9Cr1Mo steel was investigated at 850 C at an impingement angle of (ALPHA) =30 deg in an oxidizing atmosphere. The study was undertaken to provide knowledge for the understanding of the behavior of this alloy in such applications as fluidized bed combustors. It was determined that the erosion mechanism and rates and the resulting scale morphologies were considerably different than those which occur at an impingement angle of (ALPHA)=90 deg, all other test conditions being the same. There was a variation in the concentration of particles above the surface at different locations across the eroded corroded area that caused different scale morphologies to occur on the eroded scale surface. In the center or primary zone the scale eroded in a V notch configuration, further away from the center in the halo zone, intermittent nodules grew up out of a thin, continuous scale. DOE

N85-29030# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
THE EFFECT OF TEMPERATURE ON THE CORROSION-EROSION OF 9Cr1Mo STEEL
Alan V. Levy and Yong-Fa Man Jan. 1985 32 p refs Presented at the Corrosion 85 Conf., Boston, 25-29 Mar. 1985 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE85-008507; LBL-18641; CONF-850311-10) Avail: NTIS HC A03/MF A01

Effect of test temperature on the nature of the scale formation and the substrate metal thickness loss by combined erosion-corrosion was determined for 9Cr1Mo steel at temperatures up to 900(0) C in air and undried nitrogen gas streams containing 130 (MU)m Al2O3 particles. It was determined that the metal thickness loss increased with test temperature. Below ap-

proximately 750(0)C, the scale loss mechanism was low loss rate chipping while above this temperature the mechanism changed to high loss rate periodic spalling. Combined erosion-corrosion caused an effective 150(0) C to 200(0) C increase in the corrosion scale morphology compared to the structures that resulted from dynamic corrosion without particles in the stream. DOE

N85-29031# Language Center, Pittsburgh, Pa.
AGE HARDENING AND ATOMIC STRUCTURE OF AN ALUMINUM-6 AT. % SILVER ALLOY
Heinz Auer and Volkmar Gerold [1985] 19 p Transl. into ENGLISH of unknown German document
(Contract DE-AC05-84OR-21400)
(DE85-009977; ORNL-tr-5201) Avail: NTIS HC A02/MF A01

Metal research is investigating the connection between structural and qualitative changes with the goal of establishing their quantitative relationship. The structural changes of an aluminum-silver alloy during age hardening and after re-conversion is analyzed. DOE

N85-29032# Oak Ridge National Lab., Tenn.
THE PRECIPITATION MECHANISM IN A METALLIC SOLID SOLUTION CRYSTAL: CASE OF THE ALUMINUM-COPPER AND ALUMINUM-SILVER SYSTEMS
A. Guinier [1985] 35 p refs Transl. into ENGLISH of unknown French document
(Contract DE-AC05-84OR-21400)
(DE85-009981; ORNL-tr-5199) Avail: NTIS HC A03/MF A01

Analysis was carried out, through X-ray diffraction, of an oversaturated solid solution monocrystal before and during the precipitation of the new phase. The irregularities of the crystal lattice are revealed by abnormal diffusions outside the selective reflection directions. The dissolved atoms first gather into cores, where they tend to fall in order with the aluminum atoms; then the lattice is transformed. Comparison is made of the intermediate stages in the case of the copper and silver alloys. DOE

N85-29033# California Univ., Livermore. Lawrence Livermore Lab.
CORROSION PERFORMANCE OF METALS AND ALLOYS IN A TUFF GEOCHEMICAL ENVIRONMENT
R. A. VanKonynenburg and R. D. McCright 20 Mar. 1985 7 p refs Presented at Waste Management '85 Conf., Tucson, Ariz., 24-28 Mar. 1985
(Contract W-7405-eng-48)
(DE85-009449; UCRL-91740; CONF-850314-40) Avail: NTIS HC A02/MF A01

Reference and alternate alloy systems have been chosen for use in fabricating waste packages for a potential high-level nuclear waste repository in tuff. The main corrosion concerns have been identified. Testing performed to date indicates that austenitic stainless steels would perform well as package materials under the expected conditions as well as the less likely extreme conditions so far postulated. Carbon steel appears to be adequate as a material for borehole liners. Copper-based alloys and Zircaloys are also undergoing corrosion testing, the former as alternate package materials, and the latter because of their presence as spent fuel cladding. DOE

N85-29034# General Electric Co., Schenectady, N. Y. Advanced Energy Programs Dept.
LONG-TERM MATERIALS TEST PROGRAM Quarterly Report, Jan. - Mar. 1984
1984 25 p
(Contract DE-AC21-79ET-15457)
(DE85-003248; DOE/ET-15457/1632) Avail: NTIS HC A02/MF A01

Corrosion and erosion/corrosion testing of gas turbine vane and blade base alloys and a variety of protective coating systems under the Long-Term Materials Test program surpassed 5574 hours. The pressurized Fluidized Bed Combustion (PFBC) facility at Malta, New York continues to show an exceptionally high degree of reliability and consistency in performance. Operating conditions includes a 1650 F bed temperature at 10 atmospheres pressure utilizing Pittsburgh No. 8 coal and a low alkali dolomite sulfur sorbent. After 1687 hours, unprotected nickel and cobalt base vane and blade alloys generally experienced corrosion rates of 1 to 2 mils/1000 hours at metal temperatures of 1100 F 1300 F and 1500 F. Precious metal aluminide and MCrALY coatings continue to show excellent corrosion resistance (< 0.5 mils/1000 hrs) at 1500) F, but are susceptible to varying degrees of pitting attack at 1100 F and 1300 F. Erosion/corrosion degradation rates at 800 to 900 ft/s, 1350 F and less than 100 ppM dust loading ranged from 1 to 4 mils/1000 h with corrosion predominately concentrated in areas of particle impaction indicating an erosion/corrosion synergism. DOE

N85-29035# Argonne National Lab., Ill. Materials Science and Technology Div.
HIGH-TEMPERATURE OXIDATION OF ALLOYS IN MIXED OXIDANTS
K. Natesan Feb. 1985 29 p refs Presented at the Intern. Conf. on Corrosion Sci. and Technol., Calcutta, 21-23 Feb. 1985
(Contract W-31-109-eng-38)
(DE85-009706; CONF-850274-1) Avail: NTIS HC A03/MF A01

Thermodynamic aspects of high-temperature corrosion processes occurring in complex gas mixtures are discussed, with emphasis on the role of thermochemical diagrams. The interrelationships between the corrosion behavior of materials and gas composition, alloy chemistry, and temperature are examined. A number of examples from studies on materials behavior in oxygen-sulfur environments are used to elucidate the role of thermochemistry in the understanding of oxidation processes that occur in mixed-gas atmospheres. The role of kinetic factors in scale development and breakdown is presented. On the basis of extensive morphological analyses of specimens of a number of alloys exposed to gas mixtures with different chemistries, three regimes were defined to describe the oxidation-sulfidation behavior of the alloys at elevated temperatures, and probable corrosion mechanisms for each were identified. DOE

N85-29036# Sandia Labs., Albuquerque, N. Mex. Surface Metallurgy Div.
CAVITATION EROSION OF PLASMA SPRAYED ALLOYS
M. F. Smith, H. Bhat (Intel Corp., Santa Clara, Calif.), and H. Herman (State Univ. of New York, Stony Brook) 1984 6 p refs Presented at the 2nd Natl. Thermal Spray Conf., Long Beach, Calif., 31 Oct. - 2 Nov. 1984
(Contract DE-AC04-76DP-00789)
(DE85-009542; SAND-85-0750C; CONF-8410238-2) Avail: NTIS HC A02/MF A01

The cavitation-erosion (CE) resistance of thermal sprayed protective coatings was investigated. It is suggested that there is a relation between the nature of the particle-particle cohesive bond and CE behavior. Oxide at he particle interface leads to poor CE resistance and the same happens with porosity. Improving CE resistance in metal coatings will be consistent with obtaining a dense, low porosity oxide-free deposit. DOE

N85-29037# Bendix Corp., Kansas City, Mo. Technical Communications.
AGING OF GOLD THICK-FILM SOLDER JOINTS Final Report
G. A. Becka Mar. 1985 29 p refs
(Contract DE-AC04-76DP-00613)
(DE85-009847; BDX-613-3234) Avail: NTIS HC A03/MF A01

Temperature aging effects on 90-degree peel strength and metallization lift-off were determined for soldered gold thick-film connections. Those effects to the 90-degree peel strength and the time at temperature resulting of the alloy melting point (or solidus) temperature through 500 h of aging. Sn63 alloy produced the highest peel strength soldered connections of the alloys evaluated, but the alloy consumed the greatest amount of gold in forming intermetallic compounds. Further, emtallographic sampling was performed to inspect intermetallic formation between the gold and the tin or indium constitutents. DOE

N85-29038# Sandia Labs., Albuquerque, N. Mex.
SPECIMEN THICKNESS EFFECTS FOR ELASTIC-PLASTIC CTOD TOUGHNESS OF A36 STEEL
Gerald W. Wellman, W. A. Sorem (Kansas Univ., Kansas City), R. H. Dodds, Jr. (Kansas Univ., Kansas City), and S. T. Rolfe (Kansas Univ., Kansas City) 1985 50 p refs Presented at the 18th American Society for Testing and Materials Symp., Boulder, Colo., 1 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-006992; SAND-84-2058C; CONF-850679-1) Avail: NTIS HC A03/MF A01

The effect of specimen size on the fracture-toughness behavior of A36 steel, primarily in the low-transition region was studied. This region is beyond the limits of plane-strain as defined by ASTM E-399, but in the region where failure occurs prior to any macroscopic fibrous tearing. Experimental results were obtained using Crack-Tip opening Displacement (CTOD) three-point bend specimens, and analytical results were obtained using a 3-D elastic-plastic finite-element analysis. Two specimen sizes, full thickness and reduced thickness are investigated by using the preferred t x 2t x 8t specimen size. DOE

N85-29039# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
PYROPHORIC ALKYLALUMINUM COMPOUNDS IN DECOY FLARES
Birgit Gelin Nov. 1984 40 p refs In SWEDISH; ENGLISH summary Sponsored by Material Administration of Armed Forces
(FOA-C-20562-E4; ISSN-0347-3694) Avail: NTIS HC A03/MF A01

Transportation and manufacturing of alklyaluminum compounds used in decoy flares by mixing in the solid or in the liquid state with nonpyrophoric materials are discussed. Methods for launching the flares from the aircraft as well as calculating and measuring IR-radiation from the flares are considered. Two types of flares are recommended : existing pyrotechnic flares where alkylaluminium compounds replace one or more of the compounds; and IR radiation sources made only of alklyaluminum compounds, possibly thickened with polyisobutylene. Author (ESA)

N85-29040# Hoesch Hohenlimburg A.G., Hagen (West Germany). Versuchsanstalt.
HIGH TENSILE STRENGTH, PUNCHABLE, HOT ROLLED STRIPS WITH GOOD PLASTICITY Final Report, Dec. 1983
Dietrich Schreiber and Hartwig Hiehm Bonn Bundesministerium fuer Forschung und Technology Dec. 1984 93 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-256; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19.50

Conditions of rolling for the intermediate mill for high tensile strength, hot rolled strip steel were established. Production of low alloy, fine-grained structural steel with a tensile strength between 600 and 100 N/sqmm is possible. The alloy content is selected via a rho value, converting the hot rolled strip under temperature control during lamination mainly into lower bainite. This occurs up to a lamination thickness of 4 mm. This strip is only weldable to a limited extent. It shows good plasticity and can be used for the production of structural parts by direct manufacturing.
Author (ESA)

N85-29041# Acieries Reunies de Burbach-Eich-Dudelange S.A., Voelklingen (West Germany). Saarstahl G.m.b.H.
CONTINUOUS CASTING OF QUALITY STEELS ON BILLET CASTERS Final Report, Dec. 1983
Rudolf Jaunch and Walter Courths Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 82 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-262; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 17.50

Steels suitable for billet casting were examined to extend the range of steels towards higher grades by a combination of electromagnetic mold stirring, feeding of Al wire into the mold, and ladle-to-tundish and tundish-to-mold shrouding. A marked improvement of the surface quality is achieved. A substitute for low carbon unkilled ingot cast steel for the highest drawability requirements is produced and spring wire grades (up to 0.70% C) are cast. The solidified core structures in higher carbon grades are improved. Results obtained on Al-killed steel grades and on low carbon free-cutting steel are unsatisfactory. Author (ESA)

N85-29042# Hoesch Hohenlimburg A.G., Hagen (West Germany). Qualitaetsstelle Elektroband.
MAGNETIC STEELS WITH THE LOWEST SPECIFIC TOTAL LOSSES Final Report, Jun. 1983
Albert Lex Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 104 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-263; ISSN-0340-7608) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20.50

The influence of high Al-contents of high-silicon magnetic steels on the specific total losses and cold forming characteristics was studied for magnetic steels with a Si-content from 2.50% to 3.3% and 0.50% to 1.00% Al. An examination on magnetic steels with up to 3% Si to test the cold forming characteristics on hot rolled strips shows higher bending values with increasing Al-content. The influence of the higher temperature proves to be favorable in all investigated steels. Continuous furnace annealing on production melts with 3.2% Si and 0.75% Al at a thickness of 0.50 mm yields specific total losses of 2.79 W/kg on average. On cold rolled strips of 0.35 mm thickness specific total losses of 2.61 W/kg are obtained. Test steels with 2.5 to 3.3% Si, 0.50 to 0.75% Al, and 0.05 to 0.07% Zr show higher bending values and lower magnetic aging than comparable steels without Zr. Investigations of the cutting capability of magnetic steel with 3.2% Si and 0.75% Al do not show any unfavorable effects using the tool steel X 155 Cr V Mo 12 1, which confirms experience with production melts with high silicon and aluminum contents. Author (ESA)

N85-29105# Joint Publications Research Service, Arlington, Va.
DFVLR RESEARCH IN ALUMINUM-LITHIUM ALLOYS Abstract Only
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-035) 29 Oct. 1984 p 25-26 Transl. into ENGLISH from Frankfurter Zeitung/Blick Durch Die Wirtsch. (Frankfurt/Main), 16 Aug. 1984 p 1 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

N85-29109# Joint Publications Research Service, Arlington, Va.
FRENCH, UK, SWEDISH RESEARCH IN POWDER METALLURGY, HIP
Dominique-Marie Benasteau *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 10-14 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 18 Oct. 1984 p 111-113 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-29043* National Aeronautics and Space Administration. Pasadena Office, Calif.
STABILIZED UNSATURATED POLYESTERS Patent
Otto Vogl (JPL, Pasadena, Calif.) and Eberhard Borsig, inventors (to NASA) (JPL, Pasadena, Calif.) Issued 11 Jun. 1985 8 p Filed 6 Jun. 1984 Sponsored by NASA
(NASA-Case-NPO-16103-1; US-Patent-4,523,008;

US-Patent-Appl-SN-617871; US-Patent-Class-528-288; US-Patent-Class-525-26; US-Patent-Class-525-47; US-Patent-Class-526-328; US-Patent-Class-526-329.2; US-Patent-Class-528-289; US-Patent-Class-528-303; US-Patent-Class-528-304) Avail: US Patent and Trademark Office CSCL 11B

An unsaturated polyester, such as propylene glycolmaleic acid phthalic acid prepolymer dissolved in styrene is interpolymerized with an ultraviolet absorber and/or an antioxidant. The unsaturated chain may be filled with H or lower alkyl such as methyl and tertiary alkyl such as tertiary butyl. A polymer stable to exposure to the outdoors without degradation by ultraviolet radiation, thermal and/or photooxidation is formed. Author

N85-29044* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSELY REFLECTING PAINTS INCLUDING POLYTETRAFLUOROETHYLENE AND METHOD OF MANUFACTURE Patent
John B. Schutt and Michael C. Shai, inventors (to NASA) Issued 21 May 1985 6 p Filed 26 Apr. 1984
(NASA-Case-GSC-12883-1; US-Patent-4,518,722; US-Patent-Appl-SN-604337; US-Patent-Class-523-135; US-Patent-Class-524-388; US-Patent-Class-524-567) Avail: US Patent and Trademark Office CSCL 11C

The invention pertains to a high diffuse, reflective paint comprising an alcohol soluble binder, polytetrafluoroethylene (TFE) and an alcohol for coating a substrate and forming an optical reference with a superior Lambertian characteristic. A method for making the paint by first mixing the biner and alcohol, and thereafter by mixing in outgassed TFE is described. A wetting agent may be employed to aid the mixing process.
Official Gazette of the U.S. Patent and Trademark Office

N85-29045 Department of the Air Force, Washington, D.C.
LAMINATED THERMOPLASTIC RADOME Patent
E. E. Greene, inventor (to Air Force) Issued 19 Mar. 1985 7 p Supersedes AD-D009637
(AD-D011664; US-Patent-4,506,269; US-Patent-Appl-SN-382070; US-Patent-Class-343-872) Avail: US Patent and Trademark Office CSCL 17/9

This patent discloses an improved rain resistance radome C-sandwich wall which is constructed of thermoplastic polycarbonate material. The cores are either posts or tubes and are bonded to the skins with polyurethane. The percentage of core material to air is adjusted by electrical tuning to make the optimum dielectric value for use in the gigahertz radar frequency range. GRA

N85-29046*# Materials Research, Inc., Centerville, Utah.
QUANTITATIVE ANALYSIS OF DEFECTS IN SILICON-CHARACTERIZATION OF UCP, HAMCO, AND MICROCRYSTALLINE MATERIAL
R. M. Cohen, G. B. Stringfellow, R. Natesh, and J. Dunn Jan. 1985 90 p refs Prepared for JPL
(Contracts NAS7-100; JPL-956406)
(NASA-CR-175988; DOE/JPL-956406/1; NAS 1.26:175988; DE85-006110; Drl-195; MRI-307) Avail: NTIS HC A05/MF A01 CSCL 11G

Defect density in HAMCO Czochralski silicon was measured. A sufficiently high precipitate density was found to cause a reduction in the minority carrier lifetime, and thus, cell efficiency. Mobility studies in SEMIX UCP silicon were conducted under both dark and illuminated conditions. Results from these measurements indicate that the grain boundaries act primarily as potential barriers to reduce the mobility. Neutron activation analysis was used on selected samples provided by JPL for testing of trace elemental analysis, yielding generally good results. Thin layers of microcrystalline silicon on single crystal silicon substrates were analyzed to determine hydrogen content, the ratio of amorphous/microcrystalline material, and higher efficiency when containing higher concentrations of hydrogen. DOE

N85-29047# Martin Marietta Labs., Baltimore, Md.
MECHANICAL PROPERTIES OF ADHESIVELY BONDED ALUMINUM STRUCTURES PROTECTED WITH HYDRATION INHIBITORS Final Report, 1 May 1982 - 31 Jan. 1985
G. D. Davis, J. S. Ahearn, and J. D. Venables Mar. 1985 97 p refs
(Contract N00014-80-C-0718)
(AD-A153755; MML-TR-85-7(C)) Avail: NTIS HC A05/MF A01 CSCL 11/1

The use of hydration inhibitors to improve the durability of adhesively bonded aluminum structures was investigated. Pretreatment of Forest Products Laboratory (FPL) adherends in a solution of an inhibitor, such as nitrilotris methylene phosphonic acid (NTMP), increases bond durability dramatically, so that, in some cases, hydration of the adherend is no longer the limiting step in crack propagation. Pretreatment of phosphoric-acid-anodized (PAA) adherends further improves durability so that the transition to failure in the adhesive occurs at a shorter crack length. The initial strength for bonds using epoxy adhesives is not changed by such pretreatments. Adsorption of NTMP onto FPL surfaces displaces the water initially present by the formation of P-O-Al bonds. Saturation coverage is approximately one monolayer. Adsorption of NTMP onto PAA surfaces, which have little initial water, results in the occupation of residual active sites. Hydration of an inhibited FPL surface proceeds in three steps: (1) reversible physic-sorption of water, (2) slow dissolution of the inhibitor-aluminum complex followed by rapid hydration of the freshly exposed amorphous aluminum oxide to boehmite, and (3) further hydration of the boehmite to bayerite. GRA

N85-29048# Corning Glass Works, N.Y.
DOWNDRAW EXTRUSION OF ULE(TM) GLASS Final Report, Jul. 1983 - Jul. 1984
P. M. Smith and C. E. Peters Griffiss AFB, N.Y. RADC Dec. 1984 107 p
(Contract F30602-83-C-0121)
(AD-A153783; RADC-TR-84-259) Avail: NTIS HC A06/MF A01 CSCL 11/2

This report documents an experiment to determine whether it is possible to extrude Ultra Low Expansion (ULE) silica glass. A heat cycle experiment was performed which demonstrated that the material could withstand the time/temperature cycle required in the appropriate chemical environments. Extrusion apparatus was then assembled, configured and tested. Two runs were made in which ULE was extruded. Although the results showed much scatter of the data, the mean properties of the extruded material were the same as for the control material, which suggests that with more process optimization, extrusion of ULE in sufficiently high quality for mirrors should be possible. GRA

N85-29049# Spectron Corp., Sturbridge, Mass.
PREPARATION OF HEAVY METAL FLUORIDE GLASSES IN THE BULK FORM Final Report, Oct. 1983 - Jun. 1984
P. Schultz, R. Beni, and R. Kirk Griffiss AFB, N.Y. RADC Jan. 1985 46 p
(Contract F30602-83-C-0189)
(AD-A153784; RADC-TR-84-279) Avail: NTIS HC A03/MF A01 CSCL 11/2

A controlled atmosphere glass melting facility has been designed and built at SpecTran. A program has been established to developing a reproducible process for the preparation of high purity, fluoride glasses in the bulk form. A dry-box (approx. 10 ppm H2O) has been installed. In addition, a melting furnace has been designed and built. The glasses have been melted under a dry, inert atmosphere, either nitrogen or argon. Both vitreous carbon and platinum crucibles have been used. A black phase has occurred in ten of the first twelve melts. Scanning Electron Microscopy and Energy Dispersive X-Ray Spectroscopy, as well as remelting in CC14 have been used to identify the black phase. It has been determined that water and oxygen have leaked into the melting atmosphere and caused cation reduction. With improved furnace seals, five clear melts have resulted. The inert atmosphere process

which has been established appears promising, and should be further developed. GRA

N85-29050# Princeton Univ., N. J. Dept. of Chemical Engineering.
STRUCTURE-PROPERTY RELATIONSHIPS IN POLYMERIC MATRIX MATERIALS Final Technical Report, 1 Aug. 1975 - 31 Jan. 1984
J. K. Gillham 15 Apr. 1985 14 p refs
(Contract N00014-76-C-0200)
(AD-A153929; TR-27) Avail: NTIS HC A02/MF A01 CSCL 11/4

The main results of the research program are summarized in terms of: (1) development of a time-temperature-transformation (TTT) cure diagram for thermosetting systems; (2) automation of a torsion pendulum using digital computers; (3) characterization of novel polymers, composites and transitions, and (4) development and application of a pyrolysis system for characterizing the thermal degradation mechanisms of polymers. GRA

N85-29051# Los Alamos Scientific Lab., N. Mex.
LOW DENSITY INORGANIC FOAMS FABRICATED USING MICROWAVES
T. T. Meek, R. D. Blake, and T. G. Gregory 1985 20 p refs Presented at the 9th Ann. Conf. on Composites and Advan. Ceram. Mater. and Workshop on Testing Methods for Ceram. Matrix Composites, Cocoa Beach, Fla., 20 Jan. 1985
(Contract W-7405-eng-36)
(DE85-007708; LA-UR-85-508; CONF-850122-3) Avail: NTIS HC A02/MF A01

The objective was to determine if high temperature foams could be made using microwave heating and, if so, to investigate some of their properties. Several foams were made and their compressive strengths, tensile strengths and densities were determined. Foams were made of glass, metal-glass, glass-fiber, metal-glass-fiber, and fly ash. The microwave source used was a Litton model 1521 microwave oven which operated at 2.45 GHz and had an output of 700 watts. DOE

N85-29052# Oak Ridge National Lab., Tenn.
CERAMIC TECHNOLOGY FOR ADVANCED HEAT ENGINES PROJECT Semiannual Progress Report, Apr. - Sep. 1984
M. C. Matthews Feb. 1985 117 p refs
(Contract DE-AC05-84CR-21400)
(DE85-008755; ORNL/TM-9497) Avail: NTIS HC A06/MF A01

Significant accomplishments in fabricating ceramic components for the DOE, NASA, and DOD advanced heat engine programs have provided evidence that the operation of ceramic parts in high-temperature engine environments is feasible. An assessment of needs was completed, and a five-year project plan was developed with extensive input from private industry in order to develop the industrial technology base required for reliable ceramics for application in advanced automotive heat engines. The project approach includes determining the mechanisms controlling reliability, improving processes for fabricating existing ceramics, developing new materials with increased reliability, and testing these materials in simulated engine environments to confirm reliability. Although this is a generic materials project, focus is on structural ceramics for advanced gas turbine and diesel engines, ceramic bearings and attachments, and ceramic coatings for thermal barrier and wear applications in these engines. DOE

N85-29053# Oak Ridge National Lab., Tenn.
CERAMIC COATINGS FOR HEAT ENGINE MATERIALS: STATUS AND FUTURE NEEDS
W. J. Lackey, D. P. Stinton, G. A. Cerny, I. L. Fehrenbacher, and A. C. Schaffhauser Dec. 1984 116 p refs
(Contract DE-AC05-84OR-21400)
(DE85-008759; ORNL/TM-8959) Avail: NTIS HC A06/MF A01

The status and potential for application of ceramic coatings to diesel and turbine engine components was assessed. Properties are tabulated for numerous materials from the oxide, carbide, nitride, and boride families. Several coating deposition processes are described and compared, including plasma spraying, electron beam evaporation, sputtering, chemical vapor deposition, sol-gel, ion, and laser techniques. Zirconia thermal-barrier coatings were emphasized, but coatings for wear and erosion resistance, lubrication, chemical protection, seals, and interfaces were also addressed. Coating characterization methods, particularly those for measuring adherence and defects, are reviewed. It was concluded that the use of coatings will expand in the future, permitting higher performance and more reliable heat engines. DOE

N85-29054# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.
CERAMIC COATINGS FOR HEAT ENGINE MATERIALS
W. J. Lackey and D. P. Stinton 1984 4 p refs Presented at the Automotive Technol. Develop. Contractors' Coord. Meeting, Dearborn, Mich., 29 Oct. 1984
(Contract DE-AC05-84OR-21400)
(DE85-005238; CONF-8410103-6) Avail: NTIS HC A02/MF A01

The status and potential for application of ceramic coatings to diesel and turbine engine components were assessed. Properties were tabulated for numerous materials from the oxide, carbide, nitride, and boride families. Promising new deposition methods and in-situ gas and solid phase characterization techniques are identified. Emphasis was placed on zirconia thermal carrier coatings, but coatings for reducing wear, erosion, and friction were also addressed. The use of coatings will expand in the future and permit higher performance and more reliable heat engines. DOE

N85-29055# Pennsylvania State Univ., University Park.
TRANSITION METAL CATALYZED TRANSFORMATIONS OF UNSATURATED MOLECULES Progress Report, 1 Aug. 1984 - 31 Mar. 1985
A. Sen Mar. 1985 5 p refs
(Contract DE-FG02-84ER-13295)
(DE85-009531; DOE/ER-13295/1) Avail: NTIS HC A02/MF A01

The homogeneous catalysis of organic transformations by transition metal compounds is of considerable practical, as well as scientific, importance because of the high efficiency, high specificity and low energy demands often associated with such systems. The two catalytic systems under current study are: the palladium(II) and rhodium(I) catalyzed copolymerization and cooligomerization of olefins with carbon monoxide, and the palladium(II) catalyzed tail to tail dimerization of alkyl acrylates. For the former system, our studies have resulted in the elucidation of the unique chain growth mechanism. Further mechanistic studies on the individual steps in the chain growth sequence and the examination of the scope of the copolymerization reaction are being carried out presently. With respect to the latter catalytic system, the reactivity studies on compounds that model the possible intermediates are currently under way. DOE

N85-29056# Nevada Univ., Reno.
PHOTOPHYSICAL STUDIES OF TRIPLET EXCITON PROCESSES IN PURE POLYMER FILMS Technical Progress Report, 28 Jul. 1984 - 15 Feb. 1985
Richard D. Burkhart 1985 20 p
(Contract DE-FC08-84ER-45107)
(DE85-008571; DOE/ER-45107/1) Avail: NTIS HC A02/MF A01

The major objective of the work being carried out on this project is the reliable determination of the speed and migratory range of triplet excitons in pure polymer films. The work has been partitioned into two broadly defined subdivisions. Under the heading of methods development, the most important one is the project involving high intensity laser excitation followed by transient absorption. A system based on a XeCl excimer laser has been constructed and tested on a monomeric system 1,2-benzanthracene (BNZ). A second method being investigated involves the preparation of polymers having terminal groups specifically tailored for energy absorption at one end, energy emission at the other end and triplet exciton conduction between the two. Several polystyrene samples having terminal acetophenone-like units (the unique absorber) and naphthalene

units (the emitter) have been prepared and are currently under study. A third area of study involving methods is associated with the kinetics of interversus intramolecular exciton migration in polymer solutions. DOE

N85-29057# Argonne National Lab., Ill.
MOLTEN CARBONATE FUEL CELL CATHODE MATERIAL DEVELOPMENT
G. H. Kucera, N. W. Minh, J. L. Smith, and F. C. Mrazek 1985 5 p Presented at the Fuel Cell Seminar, Tucson, Ariz., 19 May 1985
(Contract W-31-109-eng-38)
(DE85-010268; CONF-850511-1) Avail: NTIS HC A02/MF A01

The evaluation of possible alternative cathode materials has been the principal molten carbonate fuel cell activity at Argonne National Laboratory. The focus of the effort has been on examining the effect of synthesis and sintering environment on materials properties and on understanding the mechanisms of conduction. Materials are synthesized under a range of typical cathode gas compositions at 1- and 10-atm pressure. The resultant product(s) are examined by X-ray diffraction analysis to determine nominal crystal structure, phases, and the lattice constants of the unit cell. To understand the mechanisms of conduction, a characterization of electrical conductivity is needed. This requires that charge type, charge carrier concentration, and charge mobility be determined as a function of temperature, composition, and gaseous environment. Because these quantities can't be completely determined by direct experimentation, several different types of experimental measurements must be used in combination with theoretical interpretation. DOE

N85-29058# Solarex Corp., Rockville, Md.
SEMICRYSTALLINE CASTING PROCESS DEVELOPMENT AND VERIFICATION Final Report, 19 Jun. 1980 - 28 Feb. 1984
1984 339 p refs
(Contract DE-FC01-80ET-23197)
(DE85-007695; DOE/ET-23197/T11) Avail: NTIS HC A15/MF A01

The Ubiquitous Crystallization Process is a viable technology for the high volume production of semicrystalline sheet material. Engineering aspects leading to the demonstration of technology feasibility are discussed, and the fundamental research to gain a basic understanding of the mechanisms influencing the electrical and material properties of polycrystalline silicon is described. Economic analyses, high temperature systems development, performance analysis, and wafering and sizing systems development are discussed. Basic research efforts include mechanisms limiting solar cell performance, mechanisms impacting yield and productivity, and material evaluation techniques. DOE

N85-29059# Sandia Labs., Albuquerque, N. Mex.
THERMAL DONOR REMOVAL BY RAPID THERMAL ANNEALING: INFRARED ABSORPTION
Herman J. Stein, S. K. Hahn (Siltec Corp.), and S. C. Shatas (AG Associates) 1985 6 p refs Presented at the 2nd Spring Meeting of the Materials Research Society, San Francisco, 15 Apr. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010092; SAND-84-2365C; CONF-850421-1) Avail: NTIS HC A02/MF A01

Rapid thermal annealing of thermal donors in Si with 10 anneal times at temperatures between 600 and 1000 C was investigated by infrared absorption at 80 K. Thermal donors A through D, which are identified by excited state absorption, are present in as grown Czochralski Si; whereas excited states for donors A through F and photoionization of thermal donors are observed after extended heating at 450 C. Tne temperature required for rapid thermal annealing is lower when only donors A through D are present. Removal of thermal donors A through F by rapid thermal annealing at temperatures greater than or equal to 800 C restores 7 to 8 oxygen atoms to interstitial sites per electrically measured donor removed. This ratio supports oxygen cluster models for thermal donors but does not support previous suggestions that such clusters are embryonic forms of high temperature oxygen precipitates. DOE

N85-29060# SKF Industries, Inc., King of Prussia, Pa.
PREDICTING MICROFRACTURE IN CERAMICS VIA A MICRO-CONTRACT MODEL
1984 35 p refs
(Contract DE-AC02-84ER-13163)
(DE85-005654; DOE/ER-13163/T2) Avail: NTIS HC A03/MF A01

An index for brittle ceramic surfaces the proportion of contacts that result in cone cracking on the microscale is proposed. Data are used from the literature giving the static and sliding fracture loads of SiC and Mn-Zn-Ferrite ceramics under diamond indentor/sliders of varying radii. A fracture mechanics analysis developed by Frank and Lawn is used for the static case and by Lawn is used for the sliding case, to convert the fracture load to the equivalent value that would result if the indentors were not diamond but were made of the ceramic itself. Topographical data gathered on two circumferentially ground ceramic disks (Si3N4 and ZRO2) are used with the Greenwood-Williamson microcontact model to calculate the fracture fraction of contacts when each rough ceramic surface contacts a smooth surface of the same material, both statistically and sliding with various values of the interfacial coefficient of friction. Microcontact models are discussed and the Greenwood-Williamson model and its predictions are compared to those of the more general model ASPERSIM. DOE

N85-29061# Los Alamos Scientific Lab., N. Mex. Materials Chemistry Group.
SYNTHESIS CHEMISTRY OF CERAMICS BY SOLID-STATE COMBUSTION PROCESSES IN MICRO-GRAVITY
Steven M. Valone and Robert G. Behrens 1985 11 p refs Presented at the Spring Natl. Meeting of AIChE, Houston, Tex., 25-28 Mar. 1985
(Contract W-7405-eng-36)
(DE85-009595; LA-UR-85-1066; CONF-850357-8) Avail: NTIS HC A02/MF A01

The solid-state combustion method offers a way to produce refractory ceramics from the constituent elements. Since temperatures within the reaction zone are so high (2500 to 4000 K), there is probably melting, and surface tension and gravity-induced convection may affect the mixing process. A strongly exothermic reaction can be used to drive a weakly exothermic or endothermic reaction. DOE

N85-29062# Brookhaven National Lab., Upton, N. Y.
POLYMER RESEARCH AT SYNCHROTRON RADIATION SOURCES: SYMPOSIUM PROCEEDINGS
Thomas P. Russell, ed. (IBM, San Jose, Calif.) and Allen N. Goland, ed. Jan. 1985 198 p refs Symp. held in Upton, N.Y., 29-31 Oct. 1984; sponsored in cooperation with IBM
(Contract DE-AC02-76CH-00016)
(DE85-006488; BNL-51847; CONF-8410112) Avail: NTIS HC A09/MF A01

A general overview is given of the characteristics of synchrotron radiation. Topics discussed at the symposium include: (1) time resolved X-ray scattering; (2) studies using fluorescence, ion containing polymers; (3) time resolved X-ray scattering; (4) novel applications of synchrotron radiation; (5) phase transitions in polymers; (6) X-ray diffraction on polymers; (7) recent detector advances; (8) complementary light, X-ray and neutron studies; and (9) neutron scattering studies. DOE

N85-29063# Burns and Roe, Inc., Oradell, N. J.
SODIUM CONCRETE REACTION: STRUCTURAL CONSIDERATIONS
George N. Freskakis Sep. 1984 25 p refs Presented at ASCE Conf. on Structural Eng. in Nucl. Facilities, Raleigh, N.C., 10 Sep. 1984
(Contract DE-AC15-76CL-98004)
(DE85-009031; DOE/CL-98004/29; CONF-840913-7) Avail: NTIS HC A02/MF A01

An overview of the sodium concrete reaction phenomenon, with emphasis on structural considerations, is presented. Available test results for limestone, basalt, and magnetite concrete with various test article configurations are reviewed. Generally, tests indicate reaction is self limiting before all sodium is used. Uncertainties, however, concerning the mechanism for penetration of sodium into concrete have resulted in different theories about a reaction model. Structural behavior may be significant in the progression of the reaction due to thermal-structural-chemical interactions involving tensile cracking, compressive crushing, or general deterioration of concrete and the exposure of fresh concrete surfaces to react with sodium. Structural behavior of test articles and potential factors that could enhance the progression of the reaction are discussed. DOE

N85-29064# Pennsylvania State Univ., University Park.
SLOW CRACK GROWTH IN METAL REINFORCED GLASS COMPOSITES
J. J. Mecholsky, T. L. Jessen, and R. H. Moore (Sandia Labs., Albuquerque, N. Mex.) 1985 10 p refs Presented at the 9th Ann. Conf. on Composites and Advan. Ceram. Mater. and Workshop on Testing Methods for Ceram. Matrix Composites, Cocoa Beach, Fla., 20 Jan. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010094; SAND-84-2375C; CONF-850122-7; M85010094) Avail: NTIS HC A02/MF A01

Crack velocity was measured as a function of stress intensity using the applied moment double cantilever beam technique for Kovar metal sphere reinforced borosilicate glass matrix composites. The slow crack growth measured in the metal reinforced glass composites demonstrated that the reinforcement impedes the crack front so that higher stress intensity is required for higher volume fraction reinforcement to achieve this same crack velocity. The stress corrosion susceptibility, n, was approximately the same for the glass and for the composites. Fractographic evidence showed crack from interaction with the Kovar particles. The difference in behavior with small and large cracks is discussed. DOE

N85-29065# Swansea Tribology Centre (England).
MOLYBDENUM DISULPHIDE LUBRICATION: A CONTINUATION SURVEY, 1981 - 1983
A. R. Lansdown Paris ESA 1984 140 p refs
(Contract ESTEC-5204/82/NL-GM)
(Rept-84-549; ESA-CR(P)-1973) Avail: NTIS HC A07/MF A01

The history of molybdenum disulfide as a lubricant is recalled and its chemical and physical properties are summarized. The lubrication mechanism; lubrication by molybdenum disulfide alone; bonded films; incorporation in bulk solids; use in oils and greases; related dichalcogenides; design guidance and performance prediction; and corrosion properties are discussed. Author (ESA)

N85-29066# Technische Univ., Berlin (West Germany). Inst. fuer Nichtmetallische Werkstoffe.
PREPARATION OF SINTERACTIVE SILICON NITRIDE POWDERS Final Report, Jun. 1983
Hans Hausner, Andreas Marcks, Reinhard Peitzsch, and Gerhard Woetting Bundesministerium fuer Forschung und Technologie Dec. 1984 93 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-303; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19.50

The sintering behavior of silicon nitride powders of different origin was investigated for use in gas turbine engines. The influence of powder characteristics, sintering additives and processing parameters on densification are discussed. A high-temperature dilatometer which operates up to 2300 C under a nitrogen pressure of 50 bar maximum was developed to study the sintering kinetics. Thermogravimetric investigations concerning the weight loss during sintering were performed. Author (ESA)

N85-29067# Schunk und Ebe G.m.b.H., Giessen (West Germany).
DEVELOPMENT OF CARBON BASED BRAKE LINING MATERIALS WITHOUT ASBESTOS CONTENT IN THE FORM OF CARBON-CARBON COMPOSITES AND CARBON-METAL OR CARBON-CARBIDE COMPOSITES Final Report, Jul. 1983
Wolf Huettner and Dieter Kehr Bundesministerium fuer Forschung und Technologie Mar. 1985 66 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-85-014; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 14

Three types of carbon based brake lining materials were developed to avoid the use of asbestos: (1) carbon fiber-reinforced composites, (2) isotropic fine-grained carbons containing non carbide-forming materials, (3) and isotropic fine-grained carbons containing carbide-forming metals. Pressure and sliding velocity, temperature, and the addition of carbide-forming and non carbide-forming materials were examined. Results show that carbon based linings have markedly superior wear characteristics compared to conventional systems. Author (ESA)

N85-29068# Battelle Columbus Labs., Ohio.
PROPERTIES OF POLYETHYLENE GAS PIPING MATERIALS Report, Jan. - Dec. 1983
M. J. Cassady, F. S. Uralil, A. Lustiger, and L. E. Hulbert Dec. 1984 225 p
(PB85-187045; N-4559; GRI-84/0169) Avail: NTIS HC A10/MF A01 CSCL 11I

The material properties and material behavior for selected polyethylene piping materials which have been generated over the past eleven years are summarized. The material properties evaluated include density, melt flow, molecular weight, tensile properties, slow crack growth resistance, quick burst strength, rotary fatigue strength, environmental stress crack resistance and stress rupture. Author (GRA)

N85-29069# Vanderbilt Univ., Nashville, Tenn. School of Engineering.
CONSERVATION AND SUBSTITUTION TECHNOLOGY FOR CRITICAL METALS IN BEARINGS AND RELATED COMPONENTS FOR INDUSTRIAL EQUIPMENT AND OPPORTUNITIES FOR IMPROVED BEARING PERFORMANCE
Allen G. Gray and Robert T. Nash Jan. 1985 446 p refs Presented at the Ind.-Acad.-Govt. Workshop, Nashville, 12-14 Mar. 1984
(Contract DI-BM-C0-134055)
(PB85-176246; BU-OFR-21-85) Avail: NTIS HC A19/MF A01 CSCL 13I

Available technologies and opportunities for new technologies in conservation, substitution, and displacement of critical and strategic metals in bearing systems were identified. Technologies in materials processing and design to extend the life of bearings and related components were considered. The value of an organized effort to gather and develop information for a data base on substitution and conservation technology for chromium and other critical metals that would be available as a contingency measure in the event of a crisis in supply is evaluated. GRA

N85-29114# Joint Publications Research Service, Arlington, Va.
USE OF CERAMICS IN INTERNAL COMBUSTION ENGINES
Jean-Francois Augereau *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 33-36 Transl. into ENGLISH from Le Monde (Paris), 5 Oct. 1984 p 44-45 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N85-29070*# Aerojet Techsystems Co., Sacramento, Calif.
IGNITION CHARACTERIZATION OF LOX/HYDROCARBON PROPELLANTS Final Report
B. R. Lawver, D. C. Rousar, and K. Y. Wong 30 Apr. 1985 142 p refs
(Contract NAS9-16639)
(NASA-CR-171884; NAS 1.26:171884; RPT/110174) Avail: NTIS HC A07/MF A01 CSCL 21I

The results of an evaluation of the ignition characteristics of the gaseous oxygen (Gox)/Ethanol propellant combination are presented. Ignition characterization was accomplished through the analysis, design, fabrication and testing of a spark initiated torch igniter and prototype 620 lbF thruster/igniter assembly. The igniter was tested over a chamber pressure range of 74 to 197 psia and mixture ratio range of 0.778 to 3.29. Cold (-92 to -165 F) and ambient (44 to 80 F) propellant temperatures were used. Spark igniter ignition limits and thruster steady state and pulse mode, performance, cooling and stability data are presented. Spark igniter ignition limits are presented in terms of cold flow pressure, ignition chamber diameter and mixture ratio. Thruster performance is presented in terms of vacuum specific impulse versus engine mixture ratio. Gox/Ethanol propellants were shown to be ignitable over a wide range of mixture ratios. Cold propellants were shown to have a minor effect on igniter ignition limits. Thruster pulse mode capability was demonstrated with multiple pulses of 0.08 sec duration and less. Author

N85-29071*# Aerojet Techsystems Co., Sacramento, Calif.
IGNITION CHARACTERIZATION OF LOX/HYDROCARBON PROPELLANTS Final Summary Report
B. R. Lawver 30 Apr. 1985 36 p refs
(Contract NAS9-16639)
(NASA-CR-171882; NAS 1.26:171882; RPT/AA0180) Avail: NTIS HC A03/MF A01 CSCL 21I

The results of an evaluation of the ignition characteristics of the gaseous oxygen (Gox)/Ethanol propellant combination are summarized. Ignition characterization was accomplished through the analysis, fabrication and testing of a spark initiated torch igniter and prototype 620 lbF thruster/igniter assembly. The igniter was tested over a chamber pressure range of 3.3 to 262 psia and a mixture ratio range of 0.4 to 40. The prototype thruster/igniter assembly was tested over the chamber pressure range of 74 to 197 psia and mixture ratio range of 0.778 to 3.29. Cold (-92 to -165 F) and ambient (44 to 80 F) propellant temperatures were used. Spark igniter ignition limits and thruster steady state and pulse mode, performance, cooling and stability data are presented. Spark igniter ignition limits are presented in terms of cold flow pressure, ignition chamber diameter and mixture ratio. Thruster performance is presented in terms of vacuum specific impulse versus engine mixture ratio. Gox/Ethanol propellants were shown to be ignitable over a wide range of mixture ratios. Cold propellants were shown to have a minor effect on igniter ignition limits. Thruster pulse mode capability was demonstrated with multiple pulses of 0.08 sec duration and less. Author

N85-29072# Federal Aviation Administration, Washington, D.C. Technical Center.
PRACTICAL REAL-TIME QUALITY CONTROL OF ANTIMISTING KEROSENE Final Report
Robert Hoover and Augusto Ferrara May 1985 66 p refs
(DE/FAA/CT-85/1) Avail: NTIS HC A04/MF A01 CSCL 21D

Antimisting kerosene (AMK) was developed to provide fire protection during impact survivable crashes. When the technique of blending AMK from a slurry was developed, a need arose to insure the quality of the individual blends. A die well test procedure developed for real time quality control of inline blended AMK is described. The procedure provides readouts on the concentration of the antimisting additive in the fuel and it indicates in real time any nonhomogeneity of the blended AMK. Additional tests are described which show the behavior of AMK is time dependent. Author

N85-29073# Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
RESEARCH TEST FACILITY FOR EVAPORATION AND COMBUSTION OF ALTERNATIVE JET FUELS AT HIGH AIR TEMPERATURES Annual Technical Report, 1 Feb. 1983 - 30 Jan. 1984
James E. Peters, Herman Krier, Kevin K. Kim, Robert E. Coverdill, John E. Kirwan, Steve C. Meisner, and Ki Wook Kim 1 Mar. 1984 45 p refs
(Contract F49620-83-K-0027)
(AD-A153830; UILU-ENG-84-4001; AFOSR-85-0383TR) Avail: NTIS HC A03/MF A01 CSCL 21/2

Improved gas turbine combustion performance will require the effective utilization of alternative fuels and advanced combustor concepts. Further understanding of spray combustion processes including fuel evaporation and flame propagation is required. Research is underway which features a high pressure and temperature non-vititated air system to provide air at simulated gas turbine inlet conditions. A special fuel injection system was designed to produce monodisperse sprays for the purpose of evaporation and eventual combustion experiments in our newly developed test facility. This report represents a summary of the engineering activities during the first year (of a two year contract) which was focused on the construction of a combustion test facility in which the evaporation and burning rates of jet fuels can be measured as a function of inlet conditions and fuel properties. A large heat exchanger facility which supports this research can deliver continuously non-vitiated air at flowrates up to 1 kg/sec and 600 kPa at temperatures from 300 to 900K. Details of the evaporation/combustion test section are described. Also included are the design of the fuel injection system and test results of the injector showing monodisperse sprays with drop diameters of approx. 70 micrometers. GRA

N85-29074# Naval Research Lab., Washington, D. C. Combustion and Fuels Branch.
THE DISTRIBUTION OF HIGHER n-ALKANES IN PARTIALLY FROZEN MIDDLE DISTILLATE FUELS Final Report, Oct. 1982 - Sep. 1984
T. L. VanWinkle, W. A. Affens, E. J. Beal, R. N. Hazlett, and J. DeGuzman 10 Apr. 1985 39 p refs
(AD-A153940; AD-E801121; NRL-8869) Avail: NTIS HC A03/MF A01 CSCL 21/4

In conjunction with continuing studies on the effect of composition on the freezing points of middle distillate fuels, attention was directed to partially frozen fuels. The crystals and residual liquid from partially frozen JP-5 and DFM fuel samples derived from both petroleum and shale were separated from each other and collected by means of the NRL liquid-solid separator apparatus (LSS) at several temperatures below the freezing points of the original samples. The original fuel samples, the solid material (precipitate), and liquid (filtrate) were characterized by gas chromatography (GC). The filtrate data were straightforward. As expected, Van't Hoff plot of the n-alkanes concentrations (log concentrations vs reciprocal absolute temperature) formed straight lines, and their slopes demonstrated the importance of the higher n-alkanes in fuel crystallization at cold temperatures. The precipitate data presented some problems of interpretation since it was observed that the waxy crystal precipitate matrix entrapped significant amounts of liquid (filtrate). The data on the solids which were obtained by these methods demonstrated that the higher n-alkanes play the key role in fuel crystallization at low temperatures, concentrating as much as tenfold in the crystallized solids compared to the liquid. Also, it was clearly shown that the n-alkanes form the major part, up to least 95% by weight in some fuels, of the solid crystals formed. GRA

N85-29075# Horticultural Specialties, Inc., Athens, Ga.
ALCOHOL: AN ALTERNATE ENERGY RESOURCE FOR COMMUNITY USE Final Performance Report
29 Jan. 1985 13 p refs
(Contract DE-FG44-80R4-10350)
(DE85-007731; DOE/R4-10350/T1) Avail: NTIS HC A02/MF A01

An alcohol producing facility for community use was constructed, thereby demonstrating that small land owners could, through their initiative, produce fuel from a vegetable grown on small plots of land. The rationale for the program was predicted on increasing fuel costs, decreasing fuel supplies, and on information supplied by Tuskegee Institute about a high dry matter sweet potato (Rojo Blanco, reportedly 42% dry matter and an average yield of 750 bushels/acre) which theoretically would produce at least 1.42 gallons of ethyl alcohol/bushel. In the first year, Rojo Blanco did yield 700 bushels/acre, but in subsequent years, that yield was never reached. The hypothetical 1.4 gallons/bushel was never attained because the dry matter never approached 42%. In spite of the low alcohol per bushel results, a 250 gallon batch still was built (cost of over $3000). With cost of fuel for the digester and for the fermentation coupled with the market value of sweet potatoes, we determined that community operated stills using home-grown vegetable sources for alcohol production is not economically feasible at this time. DOE

N85-29076# California Univ., Livermore. Lawrence Livermore Lab.
DETONATION BEHAVIOR OF LX-14 AND PBX-9404: THEORETICAL ASPECT
Francis H. Ree and Mat vanThiel Mar. 1985 13 p refs Presented at the 8th Symp. on Detonation, Albuquerque, N. Mex., 15-19 Jul. 1985 Submitted for publication
(Contract W-7405-eng-48)
(DE85-010038; UCRL-92420; CONF-850706-13) Avail: NTIS HC A02/MF A01

An a priori theory of statistical mechanics to describe post detonation behavior of explosives was developed. It is based on: (1) reliable intermolecular potentials, (2) an accurate statistical mechanical theory of mixtures, and (3) an efficient technique to handle reactive multiphase mixtures. The detonation properties of LX-14 and PBX-9404 were computed. The Gibbs free energy of the mixture indicates that nitrogen will phase separate from the rest of detonation products as to graphite or diamond. The theoretical Chapman-Jouguet (CJ) detonation velocities agree well with experiment, but the CJ pressures show a small discrepancy. It is suggested that CJ experiments have been insensitive to slow carbon formation. Theoretical results of overdriven shocks, the CJ adiabat, and several useful fits to the theory are discussed. DOE

N85-29077# Los Alamos Scientific Lab., N. Mex. Group M-3.
THE SHOCK DESENSITIZATION OF PBX-9404 AND COMPOSITION B-3
A. W. Campbell and J. R. Travis 1985 13 p refs Presented at the 8th Symp. on Detonation, Albuquerque, N. Mex., 15-19 Jul. 1985
(Contract W-7405-eng-36)
(DE85-009604; LA-UR-85-1114; CONF-850706-11) Avail: NTIS HC A02/MF A01

PBX-9404 and Composition B-3 were desensitized by subjecting them to shocks in the pressure range 10 to 24 kbar. Results show that the collapse of voids, and thus the activation of hot spots by shock waves, takes time and may require more than 5 microns. This time is, in a way, a counterpart of the induction time for shock initiation of a homogeneous explosive. Gittings' data are adduced to extend the results to 100 kbar and to show that at high pressures desensitization occurs in a very brief time window. When the voids are collapsed, the relatively homogeneous explosive is resistant to detonation through an Arrhenius type of reaction because of the lower shock temperature resulting from double shocking. This conclusion is supported by experiments on single crystals of HMX and by shock temperature calculations. The time required for desensitization of PBX-9404 is related to pressure by the expression p/sup 2.2/tau = 1150. DOE

N85-29078# Sandia Labs., Albuquerque, N. Mex.
SINGLE-PULSE RAMAN AND PHOTOACOUSTIC SPECTROSCOPY STUDIES OF TRIAMINOTRINITROBENZENE (TATB) AND RELATED COMPOUNDS
W. M. Trott, A. M. Renlund, and R. G. Jungst 1985 8 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010072; SAND-84-1974C; CONF-850345-15) Avail: NTIS HC A02/MF A01

Pulsed laser excited Raman scattering methods and photoacoustic spectroscopy have been applied to the study of porous, granular samples (i.e., pressed pellets) of 1,3,5-trinitrobenzene (TNB), 1-amino-2,4,6-trinitrobenzene (MATE), 1,3-diamino-2,4,6-trinitrobenzene (DATB) and 1,3,5-trinamino-2,4,6-trinitrobenzene (TATB). Single pulse spontaneous Raman spectra have been obtained for all four materials. Using 532-nm excitation, the intensity of the background emission observed with the Raman scattered light varies as the > MATB >DATB > TNB > TATB. This trend is compared to information on the long wavelength absorption edge of MATB, DATB and TATB as determined by the photoacoustic spectra of these materials. Stimulated Raman scattering has been observed for three of the compounds with conversion efficiency as follows: DATB > TATB > MATB. In the case of TATB, this process may be limited by photoinduced chemical reactions. DOE

N85-29079# Los Alamos Scientific Lab., N. Mex.
EQUATION OF STATE FOR DETONATION PRODUCTS
William Chester Davis 1985 13 p refs Presented at the 8th Intern. Symp. on Detonation, Albuquerque, N. Mex., 15-19 Jul. 1985
(Contract W-7405-eng-36)
(DE85-009608; LA-UR-85-1129; CONF-850706-12) Avail: NTIS HC A02/MF A01

The concepts of hydrodynamics and thermodynamics as they apply to equations of state for explosive products are collected and discussed. The physics behind the behavior of dense gases is considered. Some ideas about applications are presented. This paper is intended as an introduction to the subject of equation of state for detonation products. DOE

N85-29080# Bonneville Power Administration, Portland, Oreg. Office of Engineering and Construction.
FEASIBILITY OF ELECTROLYTIC HYDROGEN PRODUCTION IN THE PACIFIC NORTHWEST Final Report
J. Pratt, W. Butcher, L. Steinmann, C. Blazek, and E. Daniels Sep. 1984 272 p refs
(DE85-009856; DOE/BP-236) Avail: NTIS HC A12/MF A01

This report concludes the first phase of a two-phase project to analyze the feasibility of hydrogen production and to demonstrate the technology. In this first phase, the hydroelectric surplus was analyzed and its characteristics related to the requirements of an electrolysis plant. The state-of-the-art in hydrogen conversion processes (electrolyzers and fuel cells) was reviewed by the Institute of Gas Technology and a technical feasibility analysis was completed which addressed electrolyzers currently available from manufacturers, compressor and storage equipment, transportation technology, and hydrogen compatibility with existing Northwest pipelines and equipment. Using these data, an economic feasibility analysis was undertaken and the production cost of hydrogen was calculated. The relationships between cost of hydrogen and type of electrolyzer, price and availability of power, level of installed capacity, annual utilization factor, and cost of capital were outlined, and the cost-competitiveness of electrolytic hydrogen with other fuels and with steam-reformed hydrogen was assessed. DOE

N85-29081# Cornell Univ., Ithaca, N.Y. School of Chemical Engineering.

HEAT OF MIXING EXPERIMENTS FOR LIQUIFIED GASES Annual Report, Nov. 1983 - Oct. 1984
J. A. Zollweg and W. B. Streett Dec. 1984 17 p refs
(PB85-183697; GRI-84/0240) Avail: NTIS HC A02/MF A01 CSCL 21D

Calorimetric measurements of the excess enthalpy in the systems nitrogen/carbon monoxide at 83.82 K and carbon monoxide/methane at 91.3 K have been performed in our batch mixing calorimeter. The observed equimolar excess enthalpy for N2/CO(41.2 + or - 1.2 J/mol) is consistent with the temperature variation of G(sup E) deduced from vapor-liquid equilibrium measurements. It is much larger, though, than one would predict from conformal solution theories with Lorentz-Berthelot mixing rules. Thus it appears that the excess entropy is positive in methane-rich mixtures. Author (GRA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N85-29082* National Aeronautics and Space Administration. Pasadena Office, Calif.
RECIPROCATING MAGNETIC REFRIGERATOR EMPLOYING TANDEM POROUS MATRICES WITHIN A RECIPROCATING DISPLACER Patent
Dean L. Johnson, inventor (to NASA) (JPL, Pasadena, Calif.) Issued 2 Apr. 1985 13 p Filed 9 Mar. 1984 Sponsored by NASA
(NASA-Case-NPO-16257-1; US-Patent-4,507,928;
US-Patent-Appl-SN-588164; US-Patent-Class-62-3) Avail: US Patent and Trademark Office CSCL 13A

Disclosed is a method and apparatus for a magnetic refrigeration system. A continuously reciprocating displacer houses at least a pair of paramagnetic substances each of which is alternately driven into and out of a magnetic field. Two separate bidirectional pumping systems flow helium gas through the displacer and through both paramagnetic substances to create heat exchange conditions at two separate temperature extremes. Author

N85-29083* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INDUCTION HEATING GUN Patent
John D. Buckley, Robert J. Swaim, Robert L. Fox, and David F. Johnston, inventors (to NASA) Issued 4 Jun. 1985 9 p Filed 24 Jun. 1983 Sponsored by NASA
(NASA-Case-LAR-13181-1; US-Patent-4,521,659;
US-Patent-Appl-SN-507623; US-Patent-Class-219-10.77;
US-Patent-Class-219-10.43; US-Patent-Class-219-10.53;
US-Patent-Class-219-10.49; US-Patent-Class-156-272.4;
US-Patent-Class-156-273.9; US-Patent-Class-156-380.2) Avail: US Patent and Trademark Office CSCL 13H

A device for inductively heating and fusing thermoplastics is presented. It includes an alternating current passing through a tank circuit, the inductor member of the tank circuit is wrapped around a curved pole piece of a ferro-magnetic material. The magnetic flux arising within the inductor coil member flows to the ends of the pole piece and into a screen placed between the materials to be joined. The flux induces a current in the screen, and heat is generated to melt the thermoplastics together. Because only 30 to 150 watts of power are passed through the tank circuit, a wire which will remain cool under operational wattage may be selected, making air or fluid cooling unnecessary.
Official Gazette of the U.S. Patent and Trademark Office

N85-29084*# National Aeronautics and Space Administration. Pasadena Office, Calif.
TEN DEGREE KELVIN HYDRIDE REFRIGERATOR Patent Application
Jack A. Jones, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 14 Feb. 1985 14 p
(Contract NAS7-918)
(NASA-Case-NPO-16393-1-CU; NAS 1.71:NPO-16393-1-CU;
US-Patent-Appl-SN-701486) Avail: NTIS HC A02/MF A01 CSCL 13I

A compact hydride absorption refrigeration system with few moving parts for 10 Kelvin operation is disclosed and comprises liquid hydrogen producing means in combination with means for solidifying and subliming the liquid hydrogen produced. The liquid hydrogen is sublimed at about 10 Kelvin. By using a symmetrical all hydrogen redundant loop system, a 10 Kelvin refrigeration system can be operated for many years with only a fraction of the power required for prior art systems. Author

N85-29085*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THE STRUCTURE OF ION PLATED FILMS IN RELATION TO COATING PROPERTIES
Talivaldis Spalvins 1985 17 p refs Presented at the Appl. of Ion Plating and Ion Implantation to Mater. Conf., Atlanta, 3-5 Jun. 1985; sponsored in part by American Society for Metals and Georgia Inst. of Technology
(NASA-TM-87055; E-2599; NAS 1.15:87055) Avail: NTIS HC A02/MF A01 CSCL 13H

Ion plating is an ion assisted or glow discharge deposition technique, where ions or energetic atoms transfer energy, momentum and charge to the substrate and the growing film in a manner which can be controlled to favorably modify surface, subsurface chemistry, and microstructure. The glow discharge energizing effects from the initial nucleation stages to the final film growth are discussed. As a result, adherence, coherence, internal stresses, density and morphology of the coatings are significantly improved, over the conventional (nonion-assisted) techniques which in turn favorably affect the surface initiated failures caused by friction, wear, erosion, corrosion and fatigue. Ion plated films because of their graded coating/substrate interface, fine, uniform, densely packed film structure also induce a surface strengthening effect which improved the mechanical properties such as yield, tensile strength and fatigue life. Since a uniform, continuous film can be obtained at lower nominal film thickness, this effect is of great importance in solid film lubrication and in corrosion protection. B.W.

N85-29086# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
2 Jul. 1985 58 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-022) Avail: NTIS HC A04/MF A01

Progress is reported in West European science and technology. Areas of interest include ESA aerospace research and French factory automation. For individual titles, see N85-29087 through N85-29088.

N85-29087# Joint Publications Research Service, Arlington, Va.
ESA PRESENTS PLANS FOR EUROPEAN MANNED SPACE STATION c18
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-022) 2 Jul. 1984 p 4-10 Transl. into ENGLISH from AFP Sci. (Paris), 10 May 1984 p 23-29 (For primary document see N85-29086 18-31)
Avail: NTIS HC A04/MF A01

A concept for a space station capable of meeting Europe's needs starting in 1990, which combines the principles of the Eureca automatic station and of the European space laboratory Spacelab is described. The goal of this project is to create new materials and new products in microgravity. The disadvantages and advantages associated with the space station are addressed. B.W.

N85-29088# Joint Publications Research Service, Arlington, Va.
COMPONENT PROBLEMS PLAGUE FRENCH ROBOTICS INDUSTRY c37
Michel Defaux *in its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-022) 2 Jul. 1984 p 22-30 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 17 May 1984 p 60-66 (For primary document see N85-29086 18-31)

Avail: NTIS HC A04/MF A01

The dependence of French manufacturers of industrial robots on foreign components is examined. The issue of price control in this industry is explored. The feasibility of using electric motorization over hydraulic motorization in robot assembly is discussed.
B.W.

N85-29089# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
11 Sep. 1984 48 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-031) Avail: NTIS HC A03/MF A01

A variety of topics of scientific interest are presented. Topics covered include: (1) advanced materials; (2) aerospace; (3) the automobile industry; (4) computers; (5) factory automation; (6) microelectronics; and (7) scientific and industrial policy. For individual titles, see N85-29090 through N85-29094.

N85-29090# Joint Publications Research Service, Arlington, Va.
SPACE INSURANCE FIRMS VIEW SHUTTLE, ARIANE RELIABILITY **c12**
Fabio Pagan *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1984 p 4-7 Transl. into ENGLISH from Aviazione (Rome), May 1984 p 288-289 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

An overview comparison of the Space Shuttle and the European Ariane rocket or satellite delivery is presented. The financial ramifications of the recent failures of space shuttle launched satellites are presented from the prospective of insurance losses and comparative costs of the two competing satellite delivery systems. G.L.C.

N85-29091# Joint Publications Research Service, Arlington, Va.
DFVLR OFFICIAL ON AREAS OF US-FRG SPACE STATION COOPERATION **c18**
Harmut Sax *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1984 p 8-22 Transl. into ENGLISH from DFVLR-Nachrichten (Cologne), Jun. 1984 p 19-25 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

Goals are stated, from the German prospective, for the proposed joint U.S.-European space station program. Topics discussed include: type of station; purpose and mission of the station; and station applications. A provisional list of missions for the station includes trials in the following fields: (1) material sciences; (2) biosciences; (3) space sciences; (4) Earth surveillance; (5) communication and navigation via satellite; and (6) astronautic technology and operational support. G.L.C.

N85-29092# Joint Publications Research Service, Arlington, Va.
BRITISH BREAKTHROUGH IN LIGHTWEIGHT LITHIUM BATTERIES **c33**
C. L. Boltz *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1984 p 23-24 Transl. into ENGLISH from Elektroniker (Aarau, Switzerland), Jul. 1984 p 103 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

The Research Institute of the British Atomic Energy Establishment in Harwell, near Oxford, has succeeded in making a new rechargeable battery which produces three times the power of a lead acid storage battery and weights only one third as much.
G.L.C.

N85-29093# Joint Publications Research Service, Arlington, Va.
FRANCE'S USE OF CRAY 1, PLANS FOR NATIONAL SUPERCOMPUTER **c60**
Jean Deflaceliere *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1985 p 25-26 Transl. into ENGLISH from Les Echos Ind. (Paris), 20 Jun. 1984 p 11 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

A brief statement of the French position in the supercomputer industry is stated. At present France has no real supercomputer industry and lags the U.S. in technology. An estimated two to five year technology and marketing lag is predicted by the French. The necessity of strengthening and accelerating the present effort is clearly visible. G.L.C.

N85-29094# Joint Publications Research Service, Arlington, Va.
MULTINATIONAL PROGRAM TO DEVELOP INTELLIGENT ROBOTS **c37**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1984 p 33-36 Transl. into ENGLISH from AFP Sci. (Paris), 19 Apr. 1984 p 1-2 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

Paris--French researchers and manufacturers will cooperate on the creation of a number of autonomous multipurpose robots (RAM) to be used in a large variety of environments. The RAM program is aimed at third generation robotics, namely intelligent, generally mobile robots, which relieve workers from difficult, dangerous, or toxic tasks. G.L.C.

N85-29095# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
25 Sep. 1984 49 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-032) Avail: NTIS HC A03/MF A01

Articles and briefs on science and technology in western Europe are presented. Some subjects covered are: the policies of ESA under its new director, high power laser research in Italy, an electric car made possible by a new nickel-iron battery, computer aided design for the European Airbus, lightning safe fiber composites, and Europe's primary producers of industrial lasers. For individual titles, see N85-29096 through N85-29101.

N85-29096# Joint Publications Research Service, Arlington, Va.
NEW ESA DIRECTOR ON ARIANE, SPACE STATION, FUTURE TRENDS **c12**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 1-4 Transl. into ENGLISH from Flug Rev. (Stuttgart), Jul. 1984 p 32-33 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

An interview with the new general director of the European Space Agency (ESA) by a West Germany periodical is given. Thoughts on the policies and direction ESA will take under the new director are presented. Further development of Ariane, cooperation with NASA on the Space Station and budgeting directions are some areas explored. E.R.

N85-29097# Joint Publications Research Service, Arlington, Va.
RESULTS OF ITALIAN RESEARCH IN HIGH POWER LASERS **c36**
Gian Franco Cirri *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 5-10 Transl. into ENGLISH from Ata-Ingr. Automotoristica (Turin), May 1984 p 324-329 Presented at Meeting on Lasers, Milan, 26-27 May 1983 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

A general discussion of the applications available for high power lasers is presented. Several laser centers are named which are available for inquiries of the Italian industry about problems and specific testing and experimentation with lasers. The main research activities named are in basic technological analysis, specific systems for cutting and marking by lasers, the establishment of data banks applicable to lasers and security standards related to laser operations. E.R.

N85-29098# Joint Publications Research Service, Arlington, Va.
ELECTRIC PEUGEOT TO HAVE NEW NICKEL-IRON BATTERIES **c33**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 11-22 Transl. into ENGLISH from Wiener Zeitung (Vienna), v. 28/29, supplement, Jul. 1984 p 16 (For primary

document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

Four articles, one from Austria and three from France, announce the introduction of a new electric automobile. The new car is a French made Peugeot. A feasible electric car is made possible by the development of a new nickel-iron battery. The new battery is smaller and lighter in weight. Specifications are given and discussed along with the working range and charge efficiency data. E.R.

N85-29099# Joint Publications Research Service, Arlington, Va.
MBB EXPANDS CADAM SYSTEM FOR A 320 PROGRAM c61
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 23-24 Transl. into ENGLISH from Flug Rev. (Stuttgart), Aug. 1984 p 82-83 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

The use of computers in aircraft design in West Germany is discussed. Monitor screens are used extensively in computer aided design or the European Airbus. Time gain in drafting and drafting modifications is an important feature. E.R.

N85-29100# Joint Publications Research Service, Arlington, Va.
LIGHTNING-SAFE CARBON FIBER COMPOSITE FOR AIRBUS TAIL UNIT c24
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 25-26 Repr. from Frankfurt. Zeitung/Blick Durch die Wirtschaft (Franfurt am Main), 1 Aug. 1984 p 6 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

Airplanes with large-area structures of graphite-fiber composite materials (CFK) fly with absolute safety even in storms. This was demonstrated during a recent series of lightning strike tests on an Airbus-A310 vertical tail spar of the Airbus material developed and built by Messerschmitt-Boelkow-Blohm GmbH (MBB) in Hamburg and Stade. The 300,000 volt lightning bolts were generated in the Institute for Plasma Physics at the University of Hannover. Lengthy studies by MBB and test measurements on CFK samples in the Institute for Plasmas Physics show how to design for safety from lightning strikes. The tests on the CFK vertical tail spar include direct effects such as holes in the material and melted rivets and indirect effect such as the coupling of the electromagnetic energy of the lightning into the aircraft's electronic circuits. Damage is shown to be mimimal. E.R.

N85-29101# Joint Publications Research Service, Arlington, Va.
EUROPE'S PRIMARY PRODUCERS OF INDUSTRIAL LASERS SURVEYED c36
Hanns Benninghoff *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 29-33 Transl. into ENGLISH from Tech. Runschau (Bern), 31 Jul. 1984 p 17-19 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

Brief descriptions of services offered by western Europe's primary producers of industrial lasers are presented. The service offered most is laser cutting. Other laser machine services are also discussed such as drilling of sheet materials, machining of hollow pieces and tubes, and laser welding. The most common laser used is the carbon dioxide laser. E.R.

N85-29102# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
29 Oct. 1984 2 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-035) Avail: NTIS HC A04/MF A01

Scientific topics covered in this technology transfer from Western Europe include the following: (1) advanced materials; (2) aerospace; (3) the automobile industry; (4) computers; (5) factory automation; (6) metallurgical industries; (7) microelectronics; and (8) scientific and industrial policy. Most are written in a general manner and are not technically specific. For individual titles, see N85-29103 through N85-29107.

N85-29103# Joint Publications Research Service, Arlington, Va.
ARIANE SPACE GENERAL DIRECTOR ON SATELLITE LAUNCHER MARKET c15
Jacques Girardon *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-85-035) 29 Oct. 1984 p 4-9 Transl. into ENGLISH from Sci. and Avenir (Paris), Sep. 1984 p 48-51 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

A brief non-technical overview of the Ariane space program for satellite delivery is given. G.L.C.

N85-29104# Joint Publications Research Service, Arlington, Va.
BRITISH SUPER-SHUTTLE Abstract Only c15
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-035) 29 Oct. 1984 p 10 Transl. into ENGLISH from AFP Sci. (Paris), 30 Aug. 1984 p 26 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

British Aerospace, the nationalized aerospace manufacturer, confirmed that a space shuttle of new design is indeed being studied, and that a model of the craft will be displayed. The British television network ITN had announced that secret plans were being prepared for the construction of a reusable horizontal takeoff super-shuttle, which could breathe atmospheric oxygen to supply its propulsion system. Retracting a first denial according to which the project existed merely as scribbles on the back of an envelope, a British Aerospace spokesperson declared that it was in fact a very serious study. The super-shuttle, called HOTOL (horizontal takeoff and landing), would be placed in orbit as a platform for satellite launching. The spokesperson further indicated that with a certain resemblance to the Concorde, it would be pilotless, remote controlled, and would allow frequent operations at short time intervals. G.L.C.

N85-29105# Joint Publications Research Service, Arlington, Va.
DFVLR RESEARCH IN ALUMINUM-LITHIUM ALLOYS Abstract Only c26
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-035) 29 Oct. 1984 p 25-26 Transl. into ENGLISH from Frankfurter Zeitung/Blick Durch Die Wirtsch. (Frankfurt/Main), 16 Aug. 1984 p 1 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

The youthful metal aluminum is receiving competition from modern composite materials such as graphite-fiber reinforced plastics whose specific strengths (strength per unit of weight) can be higher than modern high-strength aluminum alloys. Of course, the strength of composite materials is strongly directional, but materials applications frequently do not require strength isotropy. Thus, with such composite materials, designers can undercut the already low specific weight–2.8 grams per cubic centimeter-of modern high-strength aluminum alloys and lower the weight of aircraft structures. This translates into fuel savings, an attractive offering since the climb in fuel prices in the 1970s. A Boeing study in this area forecasts that the weight fraction of aluminum will decrease during the next decade from today's approximately 80 percent to 10 percent while the weight fraction of composite materials will increase from today's approximately 3 percent to 65 percent. G.L.C.

N85-29106# Joint Publications Research Service, Arlington, Va.
PHILIPS RESEARCHES GALLIUM ARSENIDE USE FOR LASERS Abstract Only c36
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-035) 29 Oct. 1984 p 27-28 Transl. into ENGLISH from Tech. Rundschau (Bern), 21 Aug. 1984 p 7 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

The field of applications for lasers continues to expand. A distinct synergy exists between laser research and the appearance of modern communications, filing, and entertainment systems in which tailored lasers play the central role. For glass-fiber communications, the long-wavelength laser is indispensable. The optoelectronic filing system with optical storage disks requires a somewhat shorter-wave laser with relatively high power which can

burn the information into the disk in the form of troughs; required with this is also a laser with lower power which reads out the information. G.L.C.

N85-29107# Joint Publications Research Service, Arlington, Va.
RIFA OF SWEDEN CONDUCTS RESEARCH IN 3-5 MATERIALS **c76**
Heinz-Friedberg *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-035) 29 Oct. 1984 p 29-31 Transl. into ENGLISH from Elektron. Ind. (Heidelberg), no. 7/8, 1984 p 70-71 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

Laser diodes, fast photo diodes and ultrafast logic for signal processing are indispensable components for optical communications systems. In order to be independent of commercially-available components in this futuristic area, the Swedish firm Rifa has established its own development program. G.L.C.

N85-29108# Joint Publications Research Service, Arlington, Va.
WEST EUROPE REPORT: SCIENCE AND TECHNOLOGY
27 Nov. 1984 87 p Transl. into ENGLISH from various West European articles
(JPRS-WST-84-037) Avail: NTIS HC A05/MF A01

Progress in West European science and technology is reported. Topics discussed include: materials science, aerospace technology and planning, automobile industry, civil aviation, computers, factory automation, microelectronics, technology transfer, and scientific and industrial policy. For individual titles, see N85-29109 through N85-29115.

N85-29109# Joint Publications Research Service, Arlington, Va.
FRENCH, UK, SWEDISH RESEARCH IN POWDER METALLURGY, HIP **c26**
Dominique-Marie Benasteau *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 10-14 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 18 Oct. 1984 p 111-113 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

The nontraditional forming processes in powder metallurgy imply the existence of some traditional processes. The potential of powders and their application is outlined. These techniques turn out to be complementary to the shapes, sizes and series of parts that can be made, and the nature of the alloys used. This rediscovery of powder metallurgy starts by leaving behind two preconceived ideas that hinder its development. Filter manufacturing vehicled the concept of a porous product, which was not very attractive for mechanical parts. The superalloy-isostatic pressing alliance gives all these technologies an aura of costly sophistication. Powder pressing followed by sintering is recommended. E.A.K.

N85-29110# Joint Publications Research Service, Arlington, Va.
FRG WEIGHS ESA PARTICIPATION, BUDGET ISSUES
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 15-18 Transl. into ENGLISH from Handelsblatt (Duesseldorf), 10 Sep. 1984 p 10 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

Policies and expenditures for European space operations for many years to come are outlined. The Europeans must decide in the very near future whether they want to participate in the construction of the large American space station. The decision has to be a session of the ministerial council of the European Space Agency (ESA). The construction of the large rocket suited for manned space travel, the Ariane-5, has to be decided on. European finances are examined and European space expenditures are compared to the feasibility of the projects is analyzed. E.A.K.

N85-29111# Joint Publications Research Service, Arlington, Va.
DFVLR STUDY RECOMMENDS EUROPEAN INDEPENDENCE IN SPACE SYSTEMS **c12**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 19-24 Transl. into ENGLISH from Frankfurter Z. Blick Durch die Wirtsch. (Frankfurt am Main), 27 Aug. 1984 p 3 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

The German research and development institute of air and space travel (DFVLR) recommended the construction of the European Ariane 5 booster rocket and participation in the construction of an American space station for the future development of European Space travel. The DFVLR proposes that the FRG participates in the development of serviceable platforms with manned space station elements. The development of the RM 60 rocket engine is recommended as part of the Ariane program, which will give the planned Ariane 5 rocket so much thrust that it can put a European space ferry into orbit around the Earth. The grand scenarios for European space travel which include an unmanned recovery system to supply space platforms, serviceable equatorial and polar platforms, in addition to the Ariane 5 and a European space ferry (Euro-Shuttle), are twice as high in their development costs as the other space scenarios. E.A.K.

N85-29112# Joint Publications Research Service, Arlington, Va.
ASTRONAUTICAL CONFERENCE HEARS DETAILS ON HERMES MINISHUTTLE **c16**
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 25-26 Transl. into ENGLISH from AFP Sci. (Paris), 11 Oct. 1984 p 16-18 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

A description is given of the European minishuttle Hermes, currently designed by scientists and engineers at the French Nation Center for Space Studies. The Minishuttle will be able to land on any standard airport runway 3 to 3.5 km long. Design specifications and launch plants for the Minishuttle are presented. B.W.

N85-29113# Joint Publications Research Service, Arlington, Va.
SWEDISH SPACE PROGRAM INCLUDES RESEARCH SATELLITES **c15**
Stig Nordfeldt *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 27-31 Transl. into ENGLISH from Manads J. (Stockholm), Oct. 1984 p 102-107 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

Sweden's first research satellite, the Viking, is scheduled to go into orbit in 1985. This satellite will carry out research on the Earth's magnetic field. Mission plans and launch operations for the Viking are described. Sweden's participation in the Giotto mission is also addressed. B.W.

N85-29114# Joint Publications Research Service, Arlington, Va.
USE OF CERAMICS IN INTERNAL COMBUSTION ENGINES **c27**
Jean-Francois Augereau *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 33-36 Transl. into ENGLISH from Le Monde (Paris), 5 Oct. 1984 p 44-45 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

The application of ceramics in internal combustion engine design is evaluated. Improvements in efficiency, weight and reliability can be realized with the use of ceramic engine components. The disadvantages associated with ceramic use are also addressed. B.W.

N85-29115# Joint Publications Research Service, Arlington, Va.
US RESTRICTIONS ON TECHNOLOGY TRANSFER REVIEWED **c81**
Eberhard Wisdorff *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 66-67 Transl. into ENGLISH from Handelsblatt (Duesseldorf), 19-20 Oct. 1984 p 2 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

U.S. practices concerning technology transfer limitations that may have military relevance are evaluated. The U.S. security policy on technology export is discussed in general terms. B.W.

N85-29116# National Aerospace Lab., Amsterdam (Netherlands). Technical Group ETW.
CRYOGENIC TEST TECHNOLOGY, 1984
R. J. North, D. Schimanski, and J. P. Hartzuiker, ed. Apr. 1985 28 p refs
(AGARD-AR-212) Avail: NTIS HC A03/MF A01

This report reviews the new information available on cryogenic test technology since the report of the Converters' Group on Cryogenic Test Technology was written in 1981. The present position is summarized. The major events since the Converters' report have been the completion and commissioning of the National Transonic Facility (NTF), the suspension of further work on the Douglas 4-WT blowdown tunnel, the conversion of ONERA T2 for cryogenic operation, the steady progress with the DF-LP KKK, and the slow but positive progress with the ETW project, including installation of the pilot tunnel PETW. B.W.

N85-29544*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MATERIALS AND PROCESSES CONTROL FOR SPACE APPLICATIONS
G. A. Blackburn *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 10 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 13L

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N85-29117* National Aeronautics and Space Administration. Pasadena Office, Calif.
RETINALLY STABILIZED DIFFERENTIAL RESOLUTION TELEVISION DISPLAY Patent
Carl F. Ruoff, Jr., inventor (to NASA) (JPL, Pasadena, Calif.) Issued 23 Apr. 1985 11 p Filed 28 Sep. 1982 Sponsored by NASA
(NASA-Case-NPO-15432-1; US-Patent-4,513,317;
US-Patent-Appl-SN-425204; US-Patent-Class-358-133;
US-Patent-Class-358-109) Avail: US Patent and Trademark Office CSCL 17B

A remote television viewing system employing an eye tracker is disclosed, wherein a small region of the image appears in high resolution, and the remainder of the image appears in low resolution. The eye tracker monitors the position of the viewer's line of sight. The eye tracker position data is transmitted to the remote television camera and control. Both the remote camera and television display are adapted to have selectable high-resolution and low resolution raster scan modes. The position data from the eye tracker is used to determine the point at which the high-resolution scan is to commence. The video data defining the observed image is encoded in a novel format, wherein in each data field, the data representing the position of the high resolution region of predetermined size appears first, followed by the high resolution zone video data and then the low-resolution region data. As the viewer's line of sight relative to the displayed image changes, the position of the high resolution region changes to track the viewer's line of sight.
Official Gazette of the U.S. Patent and Trademark Office

N85-29118* National Aeronautics and Space Administration. Pasadena Office, Calif.
BEAM FORMING NETWORK Patent
Paul W. Cramer, Jr., inventor (to NASA) (JPL, Pasadena, Calif.) Issued 5 Mar. 1985 12 p Filed 10 Dec. 1982 Sponsored by NASA
(NASA-Case-NPO-15743-1; US-Patent-4,503,436;
US-Patent-Appl-SN-448-441; US-Patent-Class-343-876; US-Patent-Class-455-73) Avail: US Patent and Trademark Office CSCL 20N

The network, which is connected to a layer of 134 feed elements that transmit and receive microwaves, consists of a pair of circuit boards parallel to the feed element layer. One of the two boards has 87 dividers that each divide a signal to be transmitted into seven portions, and the other board has 134 combiners that each collect seven transmit signal portions and deliver the sum to one of the feed elements. A similar arrangement is used to handle received signals. The large number of interconnections are made by printed circuit conductors radiating from each of the numerous dividers and combiners, and by providing interconnection pins that interconnect the ends of pairs of conductors lying on the two boards. The printed circuit conductors extend in undulating paths that provide maximum separation of conductors to minimize crosstalk. Author

N85-29119 Communications Research Centre, Ottawa (Ontario). Radar and Communications Technology Branch.
MEASUREMENTS OF VHF/UHF RADIO PROPAGATION IN A MARITIME TEMPERATE CLIMATE
J. H. Whitteker Mar. 1985 45 p refs
(CRC-1380) Avail: Issuing Activity

The signal strength from five television transmitters was monitored for 2 years. The path lengths ranged from 92 to 384 km, and the frequencies from 67 to 543 MHz. Two of the paths were over land, one path was mixed, and one path was over sea. The long-term statistical distribution of signal levels is in accord with the curves of NBS Technical Note 101, except that oversea UHF received power levels exceeded 10% of the time were found to be 10 to 20 dB higher than in the curves. The range of the seasonal variation of the monthly median signal level was found to be from 5 to 16 dB, with the greatest variation on the long oversea path. The range of the diurnal variation of the hourly median signal was found to be from zero to 7 dB, with the greatest variation in the summer and the most prominent variation on the shortest path. Signals were strongest in summer and in early morning. E.A.K.

N85-29120*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
A METHOD AND APPARATUS FOR OPERATING ON COMPANDED PCM VOICE DATA Patent Application
Frank Byrne, inventor (to NASA) Filed 28 Sep. 1984 15 p
(NASA-Case-KSC-11285-1; NAS 1.71:KSC-11285-1;
US-Patent-Appl-SN-06/655601) Avail: NTIS HC A02/MF A01 CSCL 17B

A method and apparatus for digitizing audio signals being generated from plurality of parties in order to provide audio communication between the parties with a minimum of interference. Audio signals are converted to a pulse code modulator companded signal for transmitting to a remote location and then converting each of the companded signals to a first eight parallel signal. Each of the eight bit parallel signals from the individual parties are fed to a read-only memory (ROM) causing the ROM to produce an eight bit signal on the output representing the instantaneous sum of the eight bit parallel signals being supplied to the imputs thereof. The eight bit parallel signal appearing on the output of the ROM is converted to a serial digital by a parallel to serial converter (50) for transmitting over a single line (52) to another serial to parallel coverter (54) prior to being fed through a digital to analog converter to the receiver (58) for producing the audio signal at the receiver. NASA

N85-29121*# National Aeronautics and Space Administration. Pasadena Office, Calif.
TONE CALIBRATED DIGITAL RADIO COMMUNICATION SYSTEM Patent Application
Faramaz Davarian, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 2 May 1985 23 p
(Contract NAS7-918)
(NASA-Case-NPO-16414-1-CU; NAS 1.71:NPO-16414-1-CU;
US-Patent-Appl-SN-727719) Avail: NTIS HC A02/MF A01 CSCL

17B

A transmitter for digital radio communication creates a null by balanced encoding of data modulated on an RF carrier, and inserts a calibration tone within the null. It is accomplished by having the calibration tone coincide in phase and frequency with the transmitted radio frequency output, for coherent demodulation of data at the receiver where the tone calibration signal is extracted and used for multipath fading compensation. Author

N85-29122# Japan Broadcasting Corp., Tokyo. Radio Engineering Research Div.

CHANNEL MULTIPLEXERS FOR BROADCAST SATELLITE TRANSPONDERS IN THE 12 GHz BAND

Toshihiro Nomoto Dec. 1984 12 p refs

(NHK-Labs-Note-310; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

In order to separate the input and output signals of canonical dual-mode filters used as input multiplexers in broadcasting via satellite, a new type of configuration, i.e., an orthomode T-shaped junction suitable for waveguide manifolds, is presented. To reduce the insertion loss of the filters used for output multiplexers, several methods such as the use of cylindrical TE-113 resonant-mode cavities, the optimization of the coupling apertures, and careful selection of tuning-screw materials, are applied. Finally, the multiplexers are formed into a small, lightweight manifold multiplexer, i.e., bandpass filters for each channel are attached to a common waveguide. F.M.R.

N85-29123# Japan Broadcasting Corp., Tokyo. Auditory Science and Acoustics Research Div.

AN APPROACH TO DIGITAL LEVEL COMPRESSION USING THE ZERO-CROSSING POINTS OF PROGRAMME SIGNALS

Takashi Wakuri Nov. 1984 9 p refs

(NHK-Labs-Note-308; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

The diminution of the recovery-time in analog level control devices to increase compression efficiency has inevitable limitations. In order to obtain higher compression without large degradation of signal-quality, it is necessary to develop a new method. An attempt to develop a new method employing digital techniques was made by computer simulation. This method utilizes the nature of the zero-crossing point in audio signals in order to change control factors. In this method, the segment of the signal between a certain number of zero-crossing points is controlled by a constant control factor based on information from the same segment. This method has several distinctive features. These are high compression-efficiency, relatively low distortion for the degree of compression, and easy selection of control patterns. Author

N85-29124# Naval Weapons Center, China Lake, Calif.

A SIMULATION STUDY OF JAMMER NULLING TRADE-OFFS IN A REACTIVELY STEERED ADAPTIVE ARRAY Interim Report

Robert J. Dinger Feb. 1985 62 p refs

(AD-A153461; AD-E900450; NWC-TP-6611) Avail: NTIS HC A04/MF A01 CSCL 09/5

Antenna arrays that operate at frequencies up to 6 GHz or so on air-launched guided missiles are necessarily compact because of limited space. Research has been in progress since FY82 on a compact adaptive array that uses reactively loaded parasitic elements for pattern control. This report describes a study of this class of array whose purpose is to examine the trade-offs available among number of elements, element spacing, and number of nullable jammers. The research is part of a continuing effort to explore novel radio frequency radiating and receiving structures for application to airborne communications and radar system. GRA

N85-29125# Southeastern Center for Electrical Engineering Education, Inc., St. Cloud, Fla.

BASIC EMC (ELECTROMAGNETIC COMPATIBILITY) TECHNOLOGY ADVANCEMENT FOR C3 SYSTEMS. VOLUME 4D: MODELING CROSSTALK IN BALANCED TWISTED PAIRS Final Technical Report

D. A. Koopman and C. R. Paul Aug. 1984 166 p

(Contract F30602-81-C-0062)

(AD-A153678; RADC-TR-82-286-Vol-4D) Avail: NTIS HC A08/MF A01 CSCL 20/14

Electrical devices (computers, radar systems, communication radios, etc.) are interconnected by wires on most present systems. Electromagnetic fields produced by the excitation of these wires will cause unintentional coupling of signals onto nearby wires. This undesired electromagnetic coupling is termed crosstalk. It is important to be able to determine whether these crosstalk signals will cause the devices at the ends of the wires to malfunction. Wires are often grouped together in cable bundles or harnesses. The close proximity of wires in these bundles enhances the possibility that the crosstalk levels will be sufficiently large to cause malfunctions. The ability to predict crosstalk levels and the means to control crosstalk when it causes a problem are important to optimum system design. It interference of this type is allowed to surface during final system tests, a costly and time consuming retrofit of the wiring or the addition of filters and other interference control measures may be required. GRA

N85-29126# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

LFMR DEFINITION STUDY Final Report

Apr. 1985 267 p

(Contract N00014-84-C-2290)

(AD-A153691; AD-F300592) Avail: NTIS HC A12/MF A01 CSCL 05/1

This is the final report of the LFMR definition study. The study was commissioned to evaluate the risks associated with fabrication of a flight qualified LFMR for the NROSS mission. Trade-off studies were performed to determine the impact of the LFMR on the S/C subsystem and the other instruments. The study identified no technological risks in the fabrication and testing of the LFMR. However, dynamic balancing, flexible body interaction, and antenna pointing are areas of concern that need to be closely monitored during the design, fabrication, and test of the sensor. The report is divided into four major areas: System Engineering; Antenna Subsystem, Dynamics, and Balancing. GRA

N85-29127# Newcomb and Boyd, Atlanta, Ga.

RELIABILITY REPORT FOR COMMUNICATION NETWORKS

Huntsville, Ala. Corps of Engineers Jul. 1984 62 p ref

(AD-A153764; HNDSP-84-096-ED-ME) Avail: NTIS HC A04/MF A01 CSCL 17/2

The individual systems to be studied are a dual loop with redundant front end modems versus a radial system with eight points of connection which are shown in figures sixteen and seventeen. The ring type system as described is actually a bus configuration arranged in a loop, since each node has access to two lines. The communication lines are common to all. The radial system is actually a parallel system, since each node has its own front end modem. Each may be re-configured. GRA

N85-29128# Naval Postgraduate School, Monterey, Calif.

AN ANALYSIS OF JAMMING EFFECTS ON NONCOHERENT DIGITAL RECEIVERS M.S. Thesis

H. Y. Joo Dec. 1984 78 p

(AD-A153791) Avail: NTIS HC A05/MF A01 CSCL 17/4

The effects of various jamming waveforms on conventional binary incoherent digital receivers was analyzed in terms of resulting receiver performance (i.e., receiver probability of error). Probability density functions associated with the test statistic generated by incoherent receivers under the influence of noise and jamming have been obtained. Due to the complexity of the mathematical expressions specifying receiver probability of error in closed form, no attempt has been made to obtain absolute optimum jamming waveforms operating against binary incoherent receiver. Therefore, near optimum jammer signals were proposed, studied, and evaluated, The effect of a varying threshold on receiver performance was investigated and a jamming strategy involving use of an FM jammer was considered, and its effect evaluated. Graphical

results are presented that highlight the mathematical results obtained. GRA

N85-29129# Pennsylvania Univ., Philadelphia.
INTERACTIONS BETWEEN ELECTROMAGNETIC FIELDS Final Report, 1 Apr. - 31 Dec. 1984
H. P. Schwan 10 Feb. 1985 73 p
(Contract N00014-84-G-0045)
(AD-A153796; FR-1) Avail: NTIS HC A04/MF A01 CSCL 20/3

We applied for this grant to support a workshop at Erice, Italy. This workshop has been commonly called Erice School and the main subject of this workshop is the interaction of electromagnetic fields with biological cells and molecules. The grant from ONR enabled us to invite American scientists to participants in this workshop and deliver scientific papers. The duration of the Erice School was ten days. Therefore, we had sufficient time to discuss the problems of electromagnetic radiations. Vigorous discussions took place during official sessions and during private conversations. The participants of this workshop are mostly those who have been active in the research on bioelectromagnetics, but there are some numbers of speakers who discussed the basic electrical and magnetic properties of polyelectrolytes, biological membranes and tissue. The workshop was unique in that there were participants with a variety of training backgrounds. This enabled us to exchange the information between applied scientists and basic scientists. Also, active exchanges of opinions took place between biological scientists and physical scientists. GRA

N85-29130# California Univ., Livermore. Lawrence Livermore Lab.
AXIAL TOPOGRAPHY FROM DIGITIZED REAL TIME RADIOGRAPHY
A. S. Zolney, W. M. McDonald, P. A. Doupont, R. L. McKinney, and M. M. Lee 18 Jan. 1985 7 p refs Presented at 6th symp. on X- and gamma-ray sources and Appl., Ann Arbor, Mich., 21 May 1985
(DE85-006767; UCRL-92005; CONF-850533-1) Avail: NTIS HC A02/MF A01

Axial tomography from digitized real time radiographs provides a useful tool for industrial radiography and tomography. The components of this system are: X-ray source, image intensifier, video camera, video line extractor and digitizer, data storage and reconstruction computers. With this system it is possible to view a two dimensional X-ray image in real time at each angle of rotation and select the tomography plane of interest by choosing which video line to digitize. The digitization of a video line requires less than a second making data acquisition relatively short. Further improvements on this system are planned and initial results are reported. DOE

N85-29131# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
THE POK PROJECT; STUDIES OF INFORMATION HANDLING PROBLEMS WITH A NEW KIND OF COMMUNICATION DEVICE
Sven Dahlstedt and Bjoern Modeer Dec. 1984 41 p refs In SWEDISH; ENGLISH summary
(FOA-A-53001-H2; ISSN-0281-0239) Avail: NTIS HC A03/MF A01

Equipment in which voice communication is replaced by the transmission of very brief precoded signals is described. Learning of vocabularies ranging from 6 to 30 abbreviated codes, and sending/receiving of complete orders of varying complexity were studied. The results show that it is possible for senders and receivers to manage a vocabulary of 30 coded expressions for transmission of intelligible combat orders. Author (ESA)

N85-29132# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
THE HURRA, A HIGH RESOLUTION EXPERIMENTAL RADAR SYSTEM BROADBAND RECEIVER
Lars-Ola Stengaard Nov. 1984 67 p refs In SWEDISH; ENGLISH summary
(FOA-C-30375-E1; ISSN-0347-3708) Avail: NTIS HC A04/MF A01

Design and function of a broadband receiver for a coherent superhigh frequency radar is described. Component performance requirements and signal processing techniques, when the bandwidth is very high are discussed. Technical solutions, with schematics - signal diagrams included - and technical data are outlined. Author (ESA)

N85-29133# Research Inst. of National Defence, Linkoeping (Sweden). Dept. 3.
THE HURRA HIGH RESOLUTION EXPERIMENTAL RADAR SYSTEM SAMPLING UNIT
Bjoern Larsson Nov. 1984 47 p refs In SWEDISH; ENGLISH summary
(FOA-C-30376-E1; ISSN-0347-3708) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

Technical and functional aspects of a radar system data sampling unit are described and problems concerning the use of extremely fast analog to digital converters are discussed. Methods of evaluating the dynamic performance are shown, and test results are presented. Static and dynamic form of the output signal from the analog to digital converter depending on the slew rate; histogram test; aperture uncertainity; spectral purity; and analog bandwidth are considered. Author (ESA)

N85-29134# Logica Ltd., London (England).
GEOSTATIONARY ORBIT CAPACITY STUDY Executive Summary
P. S. Hansell, P. Norris, and R. Walton Paris ESA 12 Apr. 1982 84 p
(Contract ESA-4566/80/F-FC(SC))
(Rept-44-3558; ESA-CR(P)-1955) Avail: NTIS HC A05/MF A01

Factors influencing the communications satellite capacity of the geostationary orbit were analyzed to derive an interference model of the orbit environment. Comparison of the total orbit arc length required by each proposed planning method or by using different technology developments indicates that the orbit arc of most interest to Western Europe will not be saturated by the year 2000. The orbit arc occupied in the year 2000 by the satellites in the West European arc of interest can be approximately halved by using digital modulation techniques for TV program transfers which use FM at present, or by adopting an orbital planning method which assigns FM TV services to predefined orbit or spectrum segments. Author (ESA)

N85-29135# Logica Ltd., London (England).
PERSONAL MOBILE COMMUNICATIONS BY SATELLITE Final Report
R. J. Cocks, P. S. Hansell, R. Krawec, and D. Lewin Paris ESA Jul. 1984 116 p refs
(Contract ESA-5637/83/F-RD(SC))
(Rept-15-4572; ESA-CR(P)-1965) Avail: NTIS HC A06/MF A01

The engineering feasibility of satellite systems for paging and message services to mobile users with small terminals is demonstrated. The satellite itself would provide cover mainly in rural and semi-urban areas, but the coverage could be extended into urban areas by the use of rooftop repeaters. By comparing estimates of user costs with corresponding current costs of broadly similar terrestrial-based services, the satellite system costs are shown to be of the same order as the terrestrial costs, implying that satellite services could be operated commercially. Author (ESA)

N85-29136# SATCOM International, Toulouse (France).
STUDY OF A MEDIUM TERM FLEXIBLE FIXED SATELLITE SERVICE MISSION Final Report
C. Cougnet, J. L. Perbos, and Ph. SaintAubert Dec. 1983 63 p refs
(Contract ESA-5279/82-F-RD(SC))
(DM51/CC-IM-0185.83; ESA-CR(P)-1977) Avail: NTIS HC A04/MF A01

A European telecommunication satellite mission for the period

1995-2000 is defined. The implementation of this mission on a three satellite system (two operational and an in-orbit spare) is discussed. A flexible payload architecture allowing to adapt to traffic or service variations is proposed. It is shown that different traffic prediction studies, although performed simultaneously, can provide widely dispersed results, since communication in Europe is entering a mutation phase with the emergence of new technologies and services and the growth of existing services. Flexibility implies large spacecraft (close to the maximum capabilities of an L-SAT type platform), although their power requirements remain relatively modest, and they require a dedicated Ariane 44 launcher. Author (ESA)

N85-29137# Thomson-CSF, Meudon-la-Foret (France). Dept. Espace-Satellites.
PRELIMINARY INVESTIGATION OF THE PERFORMANCE OF REPEATER TECHNOLOGY FOR SATELLITE SOUND BROADCASTING Final Report [ETUDE EXPLORATOIRE DES PERFORMANCES DE LA TECHNOLOGIE REPETEUR POUR SATELLITE DE RADIODIFFUSION SONORE]
Biggi, Goupil, and Panzani 30 Nov. 1982 269 p In FRENCH
(Contract ESTEC-4061/79-F-FC)
(SSP/017/82; ESA-CR(P)-1992) Avail: NTIS HC A12/MF A01

The repeater technology for a low and a higher surface density broadcasting satellite (50 and 250W/channel respectively) was studied. System aspects related to payload, including multiplexing, gain, orbital spectrum utilization, and channel amplification were analyzed. Traveling wave tube (TWT) solid state, and triode amplifiers were assessed. Thermal aspects of the amplifier technologies using the L-SAT platform were considered. For 250W/channel, the TWT channel version is retained. For 50W/channel, TWT with 2 channels per amplifier, and solid state channel amplifiers are suitable. Author (ESA)

N85-29138# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
SOME FURTHER ASPECTS OF THE INFLUENCE OF RAINDROP-SIZE DISTRIBUTIONS ON MILLIMETER-WAVE PROPAGATION
E. J. Dutton and F. K. Steele Dec. 1984 33 p refs
(PB85-168334; NTIA-84-169) Avail: NTIS HC A03/MF A01 CSCL 20N

In the presence of rain, millimeter-wave propagation is acutely sensitive to the distribution of raindrop sizes along a given propagation link. This report analyzes the variability of rain attenuation prediction at microwave/millimeter wave frequencies caused from the variation of measured raindrop-size distribution data. The results show a considerable need for better and more extensive dropsize distribution data. The results show a considerable need for better and more extensive dropsize distribution data, both in time and geography. After searching for potential solutions, the report discusses the historical development of raindrop distribution measurement methodology, including direct measurement techniques, but with emphasis on indirect, or remote sensing, multiple frequency techniques. Author (GRA)

N85-29139# RF Monolithics, Inc., Dallas, Tex.
IMPROVED HIGH PERFORMANCE TELEVISION RECEIVER Final Report
D. L. Ash Apr. 1984 146 p refs
(Contract FCC-0262)
(PB85-170751; FCC/OPP/RP-84/0282) Avail: NTIS HC A07/MF A01 CSCL 17B

A recently developed high-performance television tuner/IF is discussed. The project effectively demonstrated that new device techologies in conjunction with a system that takes advantage of such new technologies can be utilized to improve TV receiver performance greatly over that which is currently realized. The theory of operation, system architecture, new component technology, and final performance of the new receiver system are all presented in this paper. GRA

N85-29140# Institute for Telecommunication Sciences, Boulder, Colo.
PREDICTING THE EFFECTS OF NON-GAUSSIAN INTERFERENCE IN HF (HIGH-FREQUENCY) BROADCASTING. PART 1: A METHODOLOGY FOR AN ANALYTIC APPROACH
David Middleton Nov. 1984 56 p refs
(PB85-171544; NTIA-CR-84-30) Avail: NTIS HC A04/MF A01 CSCL 17B

Two operational states of major interest in HF (high-frequency) broadcasting are; A, the weak-signal, or threshold cases, where message correctness or intelligibility, not primarily quality, is the principal consideration; and B, the strong-signal cases, where quality, as affected by a comparatively small amount of noise or interference, is the critical concern. In almost all cases the interference is highly non-Gaussian. Accordingly, the present study aims to provide a methodology for the subsequent quantitative treatment of the strong-signal cases, and a framework for the principal new analytic and computational tasks to be undertaken. Author (GRA)

N85-29141# Coast Guard, Washington, D.C. Office of Command, Control and Communications.
US COAST GUARD HIGH FREQUENCY EMERGENCY NETWORK (HFEN) IMPLEMENTATION PLAN Final Report
Dennis Lenyel (Arinc Research, Inc.), David Kalen (Arinc Research, Inc.), and Steven Wolf Jan. 1985 72 p
(PB85-174167; DOT-SAP-85-1) Avail: NTIS HC A04/MF A01 CSCL 17B

In the event of national disasters or emergencies. The Coast Guard HFEN will provide minimum essential communications required to support critical command, control, and communications functions and operational command decisions without the use of telephones, teletypes, and data network systems. An overview of the U.S. Coast Guard's approach to development and implementation of the needed system is presented. It has selected an alternative for implementation that builds on existing HF facilities, which rates highest from a combined coast and performance perspective of all the alternatives considered. Life cycle costs were developed for four configuration alternatives, and ranged from $1.1M to $4.1M. The implementation strategy is also described, focusing on its four key phases: (1) evaluation and design; (2) procurement; (3) installation; and (4) operation. Author (GRA)

N85-29773# University Coll., London (England). Microwave Research Unit.
OPTICAL TECHNIQUES FOR SIGNAL DISTRIBUTION AND CONTROL IN ADVANCED RADAR AND COMMUNICATION SYSTEMS
J. R. Forrest *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 14 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N85-29142* National Aeronautics and Space Administration. Pasadena Office, Calif.
CLOSED LOOP ELECTROSTATIC LEVITATION SYSTEM Patent
Won-Kyu Rhim (JPL, Pasadena, Calif.), Melvin M. Saffren (JPL, Pasadena, Calif.), and Daniel D. Elleman, inventors (to NASA) (JPL, Pasadena, Calif.) 4 Jun. 1985 8 p Filed 29 Oct. 1982 Sponsored by NASA
(NASA-Case-NPO-15553-1; US-Patent-4,521,854;

US-Patent-Appl-SN-437912; US-Patent-Class-364-400; US-Patent-Class-74-5.6D; US-Patent-Class-156-DIG.62; US-Patent-Class-364-453) Avail: US Patent and Trademark Office CSCL 09C

An electrostatic levitation system is described, which can closely control the position of objects of appreciable size. A plurality of electrodes surround the desired position of an electrostatically charged object, the position of the objects is monitored, and the voltages applied to the electrodes are varied to hold the object at a desired position. In one system, the object is suspended above a plate-like electrode which has a concave upper face to urge the object toward the vertical axis of the curved plate. An upper electrode that is also curved can be positioned above the object, to assure curvature of the field at any height above the lower plate. In another system, four spherical electrodes are positioned at the points of a tetrahedron, and the voltages applied to the electrodes are varied in accordance with the object position as detected by two sensors.

Official Gazette of the U.S. Patent and Trademark Office

N85-29143* National Aeronautics and Space Administration. Pasadena Office, Calif.

MASER CAVITY SERVO-TUNING SYSTEM Patent

Richard L. Sydnor, inventor (to NASA) (JPL, Pasadena, Calif.) Issued 14 May 1985 8 p Filed 30 Nov. 1983 Sponsored by NASA

(NASA-Case-NPO-15890-1-CU; US-Patent-4,517,530; US-Patent-Appl-SN-556513; US-Patent-Class-331-3; US-Patent-Class-331-31; US-Patent-Class-331-36C; US-Patent-Class-331-96; US-Patent-Class-331-94.1; US-Patent-Class-333-231) Avail: US Patent and Trademark Office CSCL 10A

Two collocated, weakly coupled probes, one loop and one dipole, detect the magnetic and electric fields inside a maser cavity. Signals from the probes are compared in phase, and the signal output from the phase detector is applied to a varactor, the reactance of which is coupled into the cavity by a microwave coupler. Alternatively, the varactor may be placed inside the cavity. Any deviation of phase from 90 deg as detected by the phase detector will then produce an error signal that will change the reactance coupled into the resonant cavity to change its reactance, and thus correct its resonance frequency. An alternative to using two probes is to use a single disk probe oriented to detect both the magnetic and electric fields, and thus provide the error signal directly. Author

N85-29144* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ALKALINE BATTERY CONTAINING A SEPARATOR OF A CROSS-LINKED COPOLYMER OF VINYL ALCOHOL AND UNSATURATED CARBOXYLIC ACID Patent

Li-Chen Hsu, Warren H. Philipp, Dean W. Sheibley, and Olga D. Gonzalez-Sanabria, inventors (to NASA) Issued 19 Mar. 1985 6 p Filed 10 Jul. 1981

(NASA-Case-LEW-13102-1; US-Patent-4,505,998; US-Patent-Appl-SN-282298; US-Patent-Class-429-206; US-Patent-Class-429-249) Avail: US Patent and Trademark Office CSCL 10C

A battery separator for an alkaline battery is described. The separator comprises a cross linked copolymer of vinyl alcohol units and unsaturated carboxylic acid units. The cross linked copolymer is insoluble in water, has excellent zincate diffusion and oxygen gas barrier properties and a low electrical resistivity. Cross linking with a polyaldehyde cross linking agent is preferred.

Official Gazette of the U.S. Patent and Trademark Office

N85-29145* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

REACTANCELESS SYNTHESIZED IMPEDANCE BANDPASS AMPLIFIER Patent

Leonard L. Kleinberg, inventor (to NASA) Issued 4 Jun. 1985 8 p Filed 13 Oct. 1982

(NASA-Case-GSC-12788-1; US-Patent-4,521,702; US-Patent-Appl-SN-434085; US-Patent-Class-307-520; US-Patent-Class-307-271; US-Patent-Class-307-521; US-Patent-Class-307-529; US-Patent-Class-328-167; US-Patent-Class-330-302; US-Patent-Class-330-306) Avail: US Patent and Trademark Office CSCL 09A

An active R bandpass filter network is formed by four operational amplifier stages interconnected by discrete resistances. One pair of stages synthesize an equivalent input impedance of an inductance (L sub eq) in parallel with a discrete resistance (R sub o) while the second pair of stages synthesizes an equivalent input impedance of a capacitance (C sub eq) serially coupled to another discrete resistance (R sub i) coupled in parallel with the first two stages. The equivalent input impedances aggregately define a tuned resonant bandpass filter in the roll-off regions of the operational amplifiers.

Official Gazette of the U.S. Patent and Trademark Office

N85-29146* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

HIGH VOLTAGE ISOLATION TRANSFORMER Patent

Carroll H. Clatterbuck and Arthur P. Ruitberg, inventors (to NASA) Issued 9 Apr. 1985 8 p Filed 21 Jun. 1983

(NASA-Case-GSC-12817-1; US-Patent-4,510,476; US-Patent-Appl-SN-506477; US-Patent-Class-336-84C; US-Patent-Class-336-198) Avail: US Patent and Trademark Office CSCL 10A

A high voltage isolation transformer is provided with primary and secondary coils separated by discrete electrostatic shields from the surfaces of insulating spools on which the coils are wound. The electrostatic shields are formed by coatings of a compound with a low electrical conductivity which completely encase the coils and adhere to the surfaces of the insulating spools adjacent to the coils. Coatings of the compound also line axial bores of the spools, thereby forming electrostatic shields separating the spools from legs of a ferromagnetic core extending through the bores. The transformer is able to isolate a high constant potential applied to one of its coils, without the occurrence of sparking or corona, by coupling the coatings, lining the axial bores to the ferromagnetic core and by coupling one terminal of each coil to the respective coating encasing the coil.

Official Gazette of the U.S. Patent and Trademark Office

N85-29147* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

HIGH VOLTAGE POWER SUPPLY Patent

Arthur P. Ruitberg and Kenneth M. Young, inventors (to NASA) Issued 14 May 1985 16 p Filed 6 Jul. 1983

(NASA-Case-GSC-12818-1; US-Patent-4,517,472; US-Patent-Appl-SN-511362; US-Patent-Class-307-82; US-Patent-Class-363-19; US-Patent-Class-363-23; US-Patent-Class-363-61; US-Patent-Class-363-100; US-Patent-Class-363-71; US-Patent-Class-378-104; US-Patent-Class-378-112) Avail: US Patent and Trademark Office CSCL 10B

A high voltage power supply is formed by three discrete circuits energized by a battery to provide a plurality of concurrent output signals floating at a high output voltage on the order of several tens of kilovolts. In the first two circuits, the regulator stages are pulse width modulated and include adjustable ressistances for varying the duty cycles of pulse trains provided to corresponding oscillator stages while the third regulator stage includes an adjustable resistance for varying the amplitude of a steady signal provided to a third oscillator stage. In the first circuit, the oscillator, formed by a constant current drive network and a tuned resonant network included a step up transformer, is coupled to a second step up transformer which, in turn, supplies an amplified sinusoidal signal to a parallel pair of complementary poled rectifying, voltage multiplier stages to generate the high output voltage.

Official Gazette of the U.S. Patent and Trademark Office

N85-29148 Department of the Navy, Washington, D. C.

BANDPASS FILTER FORMED BY SERIAL GRATINGS OPERATING IN A WOOD'S ANOMALY REGION Patent

P. R. Peterson and A. Gavrielides, inventors (to Navy) Issued 5 Mar. 1985 6 p Supersedes AD-D009935
(AD-D011660; US-Patent-4,502,756; US-Patent-Appl-SN-431865; US-Patent-Class-350-162.2) Avail: US Patent and Trademark Office CSCL 20/6

A bandpass filter is comprised by a plurality of reflection gratings operating in a Wood's anomaly region and arranged in serial relationship. Specifically, the gratings are serially arranged in two substantially parallel rows with the gratings in the first row offset laterally from the gratings in the second row. Further, the input to each grating is at substantially the same angle of incidence such that the output of one grating is the direct input to the next succeeding one of the gratings. Author (GRA)

N85-29149*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPARATUS FOR MOUNTING A FIELD EMISSION CATHODE Patent Application
Ben T. Ebihara and Ralph Forman, inventors (to NASA) Filed 9 May 1985 9 p
(NASA-Case-LEW-14108-1; NAS 1.71:LEW-14108-1; US-Patent-Appl-SN-732321) Avail: NTIS HC A02/MF A01 CSCL 09A

A field emission cathode is positioned in a pair of intersecting cross grooves, in the end of a ceramic tube by a metal end cap. A spring in electrical contact with the base of the cathode provides the necessary pressure to maintain continuous circumferential electrical contact between the gate film and a raised edge on the end cap. With this structure the cathode chip is self centering and easily replaceable. Also the gate film of the cathode is not abraded or rubbed during installation, and the holder is readily degassed. Author

N85-29150*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELECTRO-EXPULSIVE SEPARATION SYSTEM Patent Application
Leonard A. Haslim and Robert D. Lee, inventors (to NASA) Filed 31 May 1985 51 p
(NASA-Case-ARC-11613-1; NAS 1.71:ARC-11613-1; US-Patent-Appl-SN-739792) Avail: NTIS HC A04/MF A01 CSCL 09A

An electro-expulsive system has one or more overlapped conductors, each comprising a flexible ribbon conductor, which is folded back on itself. The conductors are embedded in an elastomeric material. Large current pulses are fed to the conductors from power storage units. As a result of the antiparallel currents, the opposed segments of a conductor are forcefully separated and the elastomeric material is distended. Void in the elastomer aid the separation of the conductor segments. The distention is almost instantaneous when a current pulse reaches the conductor and the distention tends to remove any solid body on the surface of the elastomeric material. NASA

N85-29151*# National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD FOR ULTRASONIC BONDING TO SOFT MICROELECTRONIC SUBSTRATES Patent Application
Bruce L. Conroy (JPL, Pasadena, Calif.) and Charles T. Cruzan (JPL, Pasadena, Calif.) Filed 22 Apr. 1985 7 p
(Contract NAS 7-100)
(NASA-Case-NPO-16087-1; NAS 1.71:NPO-16087-1; US-Patent-Appl-SN-725726) Avail: NTIS HC A02/MF A01 CSCL 09C

A method of ultrasonically bonding electrical leads to soft microelectronic substrates such as those which are Teflon-based is discussed. According to the inventive method, an interconnecting element such as a gold-plated copper disc is soldered to the substrate, and an electrical lead thereafter ultrasonically bonded to the interconnecting element. In contrast to the soft substrate, the interconnecting element does not dissipate ultrasonic energy and permits an ultrasonic bond to be formed between the electrical lead and interconnecting elements. NASA

N85-29152*# Rockwell International Corp., Anaheim, Calif. Microelectronics Research and Development Center.
INVESTIGATION OF SUPERLATTICE DEVICE STRUCTURES Final Report
Isoris S. Gergis, Harold M. Manasevit, Alice L. Lin, and A. Brooke Jones Washington NASA Jun. 1985 79 p refs
(Contract NAS1-16102)
(NASA-CR-3903; NAS 1.26:3903) Avail: NTIS HC A05/MF A01 CSCL 20L

This report describes the investigation of growth properties, and the structure of epitaxial multilayer Si(Si(1x)Ge(x)) films grown on bulk Silicon Substrates. It also describes the fabrication and characterization of MOSFET and MESFET devices made on these epitaxial films. Films were grown in a CVD reactor using hydrides of Si and Ge with H2 and He as carrier gases. Growth temperatures were between 900 C and 1050 C with most films grown at 1000 C. Layer thickness was between 300A and 2000A and total film thickness was between 0.25 micro m and 7 micro m. The Ge content (X) in the alloy layers was between .05 and 0.2. N-type multilayer films grown on (100) p-type Si showed Hall mobility in the range 1000 to 1500 sq cm/v for an average carrier concentration of approx. 10 to the 16th power/cu cm. This is up to 50% higher than the Hall mobility observed in epitaxial Si films grown under the same conditions and with the same average carrier concentration. The mobility enhancement occurred in films with average carrier concentration (n) from 0.7 x 10 to the 16th power to 2 x 10 to the 17th power/cu cm, and total film thickness greater than 1.0 micro m. No mobility enhancement was seen in n-type multilayer films grown on (111) Si or in p-type multilayer films. The structure of the films was investigated was using SEM, TEM, AES, SIMS, and X-ray double crystal diffraction techniques. The film composition profile (AES, SIMS) showed that the transition region between layers is of the order of about 100A. The TEM examination revealed a well defined layered structure with fairly sharp interfaces and good crystalline quality. It also showed that the first few layers of the film (closest to the substrate) are uneven, most probably due to the initial growth pattern of the epitaxial film where growth occurs first in isolated islands that eventually growth and coalesce. The X-ray diffraction measurement determined the elastic strain and strain relief in the alloy layers of the film and the elastic strain in the intervening Si layers. B.W.

N85-29153# Japan Broadcasting Corp., Tokyo. Advanced Television Systems Research Div.
DEVELOPMENT OF THIN FILM HYBRID IC ACTIVE FILTER FOR VIDEO BAND USE
Takushi Iwamoto and Tohru Mochizuki Jan. 1985 10 p refs
(NHK-Labs-Note-312; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

A high-performance resistance/capacitance (RC) active filter suitable for video-band application was developed utilizing a thin-film hybrid integrated circuit. The filter is small, lightweight, and gives high performance at low cost when operated with a wideband operational amplifier. Also instrumental in the filter's development were the CAD method, and an added amplitude compensating capacitor to compensate for the finite gain bandwith (GB) product of the operational amplifier. F.M.R.

N85-29154# Stanford Univ., Calif. Solid State Electronics Lab.
SYSTEM DESIGN OF MULTI-LAYER (3-DIMENSIONAL) INTEGRATED CIRCUITS Final Report
James F. Gibbons Apr. 1985 17 p refs
(Contract N00014-83-K-0363)
(AD-A153468) Avail: NTIS HC A02/MF A01 CSCL 09/5

Research carried out on beam processing of semiconductors led to the concept of a three dimensional integrated circuit. It was shown that MOS devices could be made on both sides of a laser-recrystallized thin film of silicon, deposited on an insulating substrate (SOI) and also on vertically arranged, recrystallized silicon films separated by insulating layers of silicon dioxide and/or silicon nitride/oxide combinations. It follows from these observations that integrated circuits can be made by vertically interconnecting devices made on separate layers. Such circuits could lead to improved

packing density, which would be important for memory applications; and possibly to increased circuit speed, which would be important for logic application. GRA

N85-29155# Baker (J. T.) Chemical Co., North Phillipsburg, N. J.
DEVELOPMENT OF A BUTTERFLY MULTIPROCESSOR TEST BED DESCRIPTION OF BUTTERFLY COMPONENTS Quarterly Technical Report, 16 Oct. 1983 - 15 Jan. 1984
J. Goodhue and E. Starr Mar. 1985 32 p
(Contract MDA903-84-C-0033; ARPA Order 4906)
(AD-A153692; AD-F300592; BBN-5872; QTR-1) Avail: NTIS HC A03/MF A01 CSCL 09/5

In this, the first in a series of quarterly technical reports on the development of a 128-node Butterfly (TM) testbed we present descriptions of the major components of the Butterfly Parallel Processor: the Processor Node (BPN), the MSI Switch Node (BSN), the VLSI Switch Node (BVSN), the Butterfly I/O Board (BI1), the Multibus Adapter (BMA), and the Butterfly Fantail (BFAN). At the end of the report, there is a set of tables that summarize the important characteristics of each component. GRA

N85-29156# Rome Air Development Center, Griffiss AFB, N.Y.
TWO-DEGREE-OF-FREEDOM LINEAR AND PLANAR MICROWAVE ARRAY LENSES
D. T. McGrath Oct. 1984 38 p
(DA Proj. 230-5)
(AD-A153701; AD-F630675; RADC-TR-84-215) Avail: NTIS HC A03/MF A01 CSCL 09/5

A new design of beamforming lens is presented. Both faces are planar arrays of microwave or millimeter wave antenna elements, interconnected by transmission lines (as in a bootlace lens) whose length vary as a function of radius. While the front face elements are regularly spaced, the back face elements are displaced radially from their corresponding front face elements, the amount of displacement also being a function of radius. Such a lens is shown to be capable of forming low sidelobe pencil beams over a solid angle of + or -25 deg or more by switching between clusters of only seven feed elements. Because both faces are planar, construction of extremely lightweight lenses for large-aperture and/or multiple-beam antennas is feasible. GRA

N85-29157# RCA Labs., Princeton, N. J.
SILICIDE CONDUCTORS RELIABILITY RESEARCH Final Report, Jun. 1983 - Sep. 1984
T. J. Faith Griffiss AFB, N.Y. RADC Feb. 1985 77 p refs
(Contract F30602-83-C-0109)
(AD-A153768; PRRL-84-CR-11; RADC-TR-85-17) Avail: NTIS HC A05/MF A01 CSCL 09/5

An investigation into the reliability of polycide conductors has been performed utilizing highspeed CMOS logic circuits (QMOS) and a parametric test circuit, the contact-resistance test vehicle (CRTV). The hermetically-packages QMOS units were split into control- and test-circuit groups; control circuits utilizing standard QMOS processing with n+ polysilicon gates, test circuits utilizing n+ polysilicon/TaSi2 (polycide) gates. Relevant features of the CRTV include long, narrow (2.5 micron to 3 micron) polycide lines connected to overlying Al or Al-1%Si Kelvin-contact patterns through small (1.5 micron x 1.5 micron to 2 micron x 2 micron) interlevel contacts, and large (600 micron x 600 micron) polycide/oxide/silicon capacitors, the (3000 A polysilicon/1600 A TaSi2) polycide being separated from the silicon substrate by an unpatterned, 500 A stream-grown gate oxide. No significant degradation in either CRTV polycide line integrity or CRTV gate-oxide breakdown strength was experienced during 30 cycles of thermal shock (-70 C to +100 C). GRA

N85-29158# RCA Ltd., Sainte Anne de Bellevue (Quebec).
DEVELOPMENT OF PHOTODETECTORS Final Technical Report, Jun. 1983 - Jun. 1984
R. McIntyre and P. Webb Griffiss AFB, N.Y. RADC Jan. 1985 54 p refs
(Contract F19628-82-C-0038)
(AD-A153773; RADC-TR-84-217; FR-4) Avail: NTIS HC A04/MF A01 CSCL 09/1

Vapor-phase-epitaxial techniques have been used to fabricate InGaAs/InP avalanche photodiodes having a SAM configuration. The APD's are mesa-etched and are unpassivated. Stable operation up to gains of about 10 has been demonstrated. Noise of all units tested has been somewhat high due to a high value of Kerr (about 0.6), and due to high bulk dark currents. Attempts to develop a satisfactory passivation for the mess-etched devices have been largely unsuccessful. GRA

N85-29159# Woods Hole Oceanographic Institution, Mass.
LOW-RATE DISCHARGE OF VARIOUS ELECTROCHEMICAL BATTERIES FOR USE WITH OCEANOGRAPHIC INSTRUMENTS
Alfred J. Ciesluk, Brian J. Guest, Craig D. Marquette, and George H. Tupper Apr. 1985 37 p refs
(Contract N00014-76-C-0197; NR Proj. 083-400)
(AD-A153965; WHOI-85-13) Avail: NTIS HC A03/MF A01 CSCL 10/3

The endurance of self-sustained oceanographic instruments is generally limited to battery energy. Tests were initiated to measure the capacities of several types of electrochemical batteries when discharged at temperatures and rates typical of oceanographic use. Battery systems represented are alkaline-manganese dioxide, mercuric-oxide, and lithium-sulphur oxychloride. Results of tests completed so far are presented. A brief overview of those batteries best suited for use with self-sustained oceanographic instruments is included as an appendix. GRA

N85-29160# Stanford Linear Accelerator Center, Calif.
MICROSTORE: THE STANFORD ANALOG MEMORY UNIT
J. T. Walker, S. I. Chae, S. Shapiro, and R. S. Larsen Nov. 1984 6 p refs Presented at the Nucl. Sci. Symp., Orlando, Fla., 31 Oct. 1984
(Contract DE-AC03-76SF-00515)
(DE85-005534; SU-SLAC-PUB-3503; CONF-841007-61) Avail: NTIS HC A02/MF A01

An NMOS device has been developed which provides high speed analog signal storage and readout for time expansion of transient signals. This device takes advantage of HMOS-1 VLSI technology to implement an array of 256 storage cells. Sequential samples of an input waveform can be taken every 5 ns while providing an effective sampling aperture time of less than 1 ns. The design signal-to-noise ratio is 1 part in 2000. Digital control circuitry is provided on the chip for controlling the read-in and read-out processes. A reference circuit is incorporated in the chip for first order compensation of leakage drifts, sampling pedestals, and temperature effects. DOE

N85-29161# California Univ., Livermore. Lawrence Livermore Lab.
ELECTRICAL LINE SOURCE AND POINT SOURCE INTERACTIONS WITH ANOMALIES IN THE GROUND
R. J. Lytle and J. A. Beatty Dec. 1984 30 p refs
(Contract W-7405-eng-48)
(DE85-009777; UCID-20372) Avail: NTIS HC A03/MF A01

Illustrative examples show that line source electrode interactions with a cylindrical anomaly serve as adequate qualitative models for point source electrode interactions with cylindrical and spherical anomalies. Subject to certain restrictions, the quantitative results for point and line source interactions with cylindrical anomalies can be approximately the same. This is of benefit, for determination, and for sensing of various anomalies within the ground. DOE

N85-29162# Sandia Labs., Albuquerque, N. Mex. Exploratory Batteries Div.
ADDITIONAL EXPERIMENTS RELATIVE TO THE SHELF LIFE OF Li(Si)/FeS2 THERMAL BATTERIES
Jimmie Q. Searcy and James R. Armijo Feb. 1985 25 p refs
(Contract DE-AC04-76DP-00789)
(DE85-008482; SAND-84-1510) Avail: NTIS HC A02/MF A01

A continuing effort to develop a new thermal battery technology

based on the Li(Si)/FeS2 electrochemical couple is reported. The results relate to the long shelf life requirement for thermal batteries designed by Sandia, and include topics relevant to leakage through the hermetic seal and accelerated aging experiments with materials new to the technology. Conclusions relevant to leakage through the hermetic seal are that the maximum leak rate must not exceed 1.8 x 10(-7) w, where w is the grams of Li(Si) contained by a battery, and that a bomb type leak test can be designed that is adequate for most Li(Si)/FeS2 batteries. Conclusions relevant to long term compatibility of new materials include the following: nickel is not compatible with the iron disulfide in the cathode; the CaSi2 additive used to suppress the initial voltage transient does not react or degrade during accelerated aging experiments, but the use of that material can lead to an increase in the variability of the activated lives, especially for long life batteries; Grafoil current collectors used with the cathode do not degrade in accelerated aging experiments. DOE

N85-29163# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
INVESTIGATION OF A Si AND RELATED SEMICONDUCTORS AS MATERIALS FOR PHOTOVOLTAIC CONVERSION Final Report, 1 Sep. 1982 - 31 Aug. 1983
W. Paul, K. MacKenzie, and R. Weisfield Dec. 1984 85 p refs
(Contracts DE-AC02-83CH-10093; EG-77-C-01-4042)
(DE85-002932; SERI/STR-211-2449) Avail: NTIS HC A05/MF A01

Research on amorphous silicon for photovoltaic uses is described. Section 1 describes a new glow discharge apparatus constructed at Harvard and initial efforts to use it to fabricate films of a-Si:H. Section 2 describes a new analysis of space-charge-limited current measurements to obtain density of gap states results. Section 2 contains a description of preliminary film properties of a-Si:H, doped a-Si:H, and a-SiGe:H films produced in the new glow discharge system. Section 4 presents more complete data on the films and describes improvements made to the discharge apparatus. DOE

N85-29164# Wisconsin Univ., Madison. Dept. of Electrical and Computer Engineering
SIMULTANEOUS PHASE AND FREQUENCY CONTROL OF A THREE-PHASE INDUCTOR-CONVERTOR BRIDGE
M. Hirano (Toshiba Electric Co.)03(Argonne National Lab., Ill.), J. J. Skiles, and R. L. Kustom 1985 6 p Presented at the 16th IEEE Ann. PESC, Toulouse, 24-28 Jun. 1985
(Contract W-31-109-eng-38)
(DE85-006197; CONF-850656-1) Avail: NTIS HC A02/MF A01

The Inductor-Convertor Bridge (ICB) is a dc-ac-dc convertor network which allows controllable energy transfer between two superconducting coils. Since an ICB system is asynchronous, both phase and frequency are controllable, and offer improved performance. Simultaneous open-loop phase angle control and closed-loop frequency control has been investigated analytically and demonstrated on a three-phase model using two 4-Hy superconducting coils. DOE

N85-29165# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Instrument Science and Engineering.
GERMANIUM DETECTORS WITH A BUILT-IN TRANSVERSE DRIFT FIELD
P. N. Luke, N. W. Madden, and F. S. Goulding Nov. 1984 8 p refs Presented at the Nucl. Sci. Symp., Orlando, Fla., 31 Oct. 1984
(Contract DE-AC03-76SF-00098)
(DE85-009944; LBL-17780; CONF-841007-63) Avail: NTIS HC A02/MF A01

A new kind of position-sensitive germanium detector based on a novel mode of charge transport is proposed and experimental devices were fabricated. In these germanium drift-chambers, position information is obtained by measuring carrier drift times. One dimensional spatial resolutions of approx. = 0.5 mm over an active area of approx. 2.5 x 2.5 sq.cm. were achieved in one detector for 60 keV photons. The simplicity of such detectors makes them attractive as position-sensitive gamma ray spectrometers compared to discrete element detectors. The problems and limitations of the present detectors are discussed. DOE

N85-29166# Argonne National Lab., Ill. Fusion Power Program.
EFFECTS OF FORMVAR COATING AND COPPER-NICKEL OUTER SHEATH ON THE ac LOSSES OF MULTI-STRAND SUBSIZE CABLES
S. H. Kim Feb. 1985 17 p refs
(Contract W-31-109-eng-38)
(DE85-010413; ANL/FPP-TM-200) Avail: NTIS HC A02/MF A01

Ac losses of two subcables, one with Formvar coating on the strands of the BNL 12-ml NbTi/Cu/CuNi conductor and another without the coating, were measured using the ANL Subcable Test Facility. The results indicate that couplings among the strands with and without the Formvar coating were quite weak. Weak coupling of the bare strands is due to the high resistance of the copper-nickel outer sheath. In the regime of B(dot) = 0 approx. 1.2 T/s and B = 0 approx. 4 T, the magnetic diffusion time constant was (3.8 - 5.7) x 10 to the -3/sec. DOE

N85-29167# California Univ., Berkeley. Lawrence Berkeley Lab. Lighting Systems Research Group.
ELECTRODELESS HID LAMP STUDY Final Report
J. M. Anderson, P. D. Johnson, C. E. Jones, and T. H. Rautenberg Jan. 1985 62 p refs Prepared in cooperation with GE, Schenectady, N.Y.
(Contract DE-AC03-76SF-00098)
(DE85-010626; LBL-19035; EEB-L-85-01) Avail: NTIS HC A04/MF A01

High intensity discharge lamps excited by solenoidal electric fields (SEF/HID) were examined for their ability to give high brightness, high efficacy and good color. Frequency of operation was 13.56 MHz (ISM Band) and power to the lamp plasma ranged from about 400 to 1000 W. Radio frequency transformers with air cores and with air core complemented by ferrite material in the magnetic path were used to provide the voltage for excitation. Electrical properties of the matching network and the lamp plasma were measured or calculated and total light from the lamp was measured by an integrating sphere. Efficacies calculated from measurement were found to agree well with the positive column efficacies of conventional HID lamps containing only mercury, and with additives of sodium, thallium, and scandium iodide. DOE

N85-29168# California Univ., Livermore. Lawrence Livermore Lab.
ALUMINUM-AIR POWER CELL: THE M3-3 EXPERIMENT
A. Maimoni and S. A. Muelder 1 Mar. 1985 37 p refs
(Contract W-7405-eng-48)
(DE85-008878; UCID-20307) Avail: NTIS HC A03/MF A01

The M3-3 experiment was a test of the M3 cell coupled to a crystallizer and hydrocyclone for separation of coarse solids before return of electrolyte to the cell. It was essentially a repeat of the M3-2 experiment, but with increased emphasis to understand the sources of experimental error and the evolution of the particle size distributions during the course of the experiment. A new hydrocyclone, scaled to operation with 1 to 5 cells, was tested in conjunction with peristaltic pumps. The test ran at 14 A for 101 min, followed by 122 A for 269 min at 60 C. The main operational problem was failure of the rubber tubing in the peristaltic pump feeding the hydrocyclone. Primary results include reasonable agreement in the material balances and with the calculated crystallization rates, the 50% cut point of the new hydrocyclone at about 8 (MU)m, and the aluminate concentration decreased from 2.4 M to 1.4 M in 21 h at 30 C in a subsequent batch crystallization experiment. The particle size distributions do not change significantly on aging de-ionized water. DOE

N85-29169# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
RESEARCH RECOMMENDATIONS FOR ac INTERFACING BETWEEN ELECTRIC UTILITY TRANSMISSION AND DISTRIBUTION SYSTEMS AND WIND, PHOTOVOLTAICS, AND OTEC

ENERGY SYSTEMS
Paul Longrigg and Elton H. Buell Mar. 1985 223 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002942; SERI/TR-216-2400) Avail: NTIS HC A10/MF A01

Work that deals semiquantitatively with many integration problems that may have to be solved as wind, photovoltaic, and ocean energy systems are tied into electrical transmission utility grids is documented. The problems that will arise as these distributed storage and generation (DSG) energy systems are integrated into the electric utility grids are not yet fully known, and their extent may depend on the level of penetration of the DSGs into the grid network. Aspects of DSG integration covered are fuse and relay coordination, harmonics, communications, control protocols, safety, and artificial intelligence (computer driven controls). An appendix on the effects of electromagnetic pulse is also included. DOE

N85-29170# Stanford Linear Accelerator Center, Calif.
BEAM TESTS OF PHOSPHORESCENT SCREENS
J. T. Seeman, V. Luth, M. Ross, and J. Sheppard 5 Mar. 1985 8 p refs
(Contract DE-AC03-76SF-00515)
(DE85-009843; SU-SLAC-CN-290) Avail: NTIS HC A02/MF A01

Twelve phosphorescent screens were beam tested for linearity, uniformity, low radiation damage and a suitable emitted wavelength for use with television cameras. One screen was chosen for the construction of several intercepting profile monitors which were used during the SLC Ten Sector Tests to measure the emittance and wakefield effects of a damped electron beam. DOE

N85-29171# Delaware Univ., Newark. Inst. of Energy Conversion.
Zn3P2 AS AN IMPROVED SEMICONDUCTOR FOR PHOTOVOLTAIC SOLAR CELLS Final Report, 1 Apr. 1983 - 31 Mar. 1984
M. Bhushan and J. D. Meakin Golden, Colo. Midwest Research Inst. Mar. 1985 61 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-83CH-10093)
(DE85-008772; SERI/STR-211-2515) Avail: NTIS HC A04/MF A01

Two heterojunctions with Zn3P2 were developed into: Zn3P2/ZnSe and Zn3P2/(CdZn)S. In both cases, improved open-circuit voltages were achieved, however, control of the material properties of the heterojunction partner has limited short-circuit currents and overall efficiency. In the case of ZnSe, the high resistivities of deposited thin-films were efficiency-limiting on all devices. In (CdZn)S high interface recombination rates control the short-circuit current and limit the overall efficiency. A more fundamental study of the Zn3P2/(CdZn)S heterojunction is necessary to further optimize this device. DOE

N85-29172# California Univ., Livermore. Lawrence Livermore Lab.
UPGRADE OF THE LLNL EM TRANSIENT RANGE MONOCONE ANTENNA
R. J. King, K. S. Kunz, H. G. Hudson, R. E. Boberg, S. T. Pennock, and D. K. Gnade Dec. 1984 6 p Presented at North Am. Radio Sci. Meeting, Vancouver, British Columbia, 17-21 Jun. 1985 Submitted for publication
(Contract W-7405-eng-48)
(DE85-006639; UCRL-91888; CONF-850669-1) Avail: NTIS HC A02/MF A01

Lawrence Livermore National Laboratory has operated an electromagnetic transient range facility (EMTRF) since 1968 using a succession of antennas. The latest upgrade involving a precision monocone antenna and the use of a shroud of EM absorbing material strategically placed around the antenna to significantly enhance the clear time is described. This upgrade has resulted in highly repeatable measurements of exterior and interior responses of test objects for frequencies up to approximately 3 GHz for times on the order of hundreds of nanoseconds. Highly resonant interior responses can now be resolved experimentally. The radiated signal is nearly as clean as that from a simple vertical radiator and the field intensity is 12 kB larger. The cone is very nearly a true conic with very small azimuthal variations. As expected, the field behaves as 1/r for periods on the order of the time required for the transient pulse to reach the cone edge. This perturbation is minimized by the use of strategically placed EM absorber which also serves to increase the clear time by minimizing room reflections, with improved pulsers it may be possible to extend the range of operation of this facility to 10-12 GHz. DOE

N85-29173# Rome Univ. (Italy). Dipt. di Fisica.
A POSSIBLE DIGITAL CIRCUIT ABLE TO RECOGNIZE MAGNETIC MONOPOLES CROSSING A THICK SCINTILLATOR COUNTER
W. Pecorella, L. Petrillo, G. Salina, and M. Severi 20 Jun. 1984 10 p refs
(NOTA-INTERNA-826) Avail: NTIS HC A02/MF A01

A CAMAC digital circuit to identify slow magnetic monopoles crossing a thick scintillator counter and to reject events of any other kind, taking advantage of the different time configurations of the corresponding signals is proposed. The circuit identifies a magnetic monopole event when it recognizes that the output signal from a photomultiplier width reproducing discriminator signal is continuous and long enough. The continuity is selected by a suitable preset threshold on a time-gap comparator. Author (ESA)

N85-29174# Rome Univ. (Italy). Dipt. di Fisica.
STUDY FOR A LARGE AREA ACRYLIC SCINTILLATOR DETECTOR
W. Pecorella, L. Petrillo, and M. Severi 20 Jun. 1984 10 p refs
(NOTA-INTERNA-827) Avail: NTIS HC A02/MF A01

The use of acrylic scintillators in a 1000—sqm magnetic monopole detector was investigated. Due to the short attenuation length, lambda, (2 to 3 m) a chess board of squared counters of dimensions of the order of lambda, directly viewed by 2 or 4 photomultipliers at the corners is suggested. The analogical sum of the outputs of the photomultipliers seeing the same counter provides the best signal to be discriminated. The outputs separately analyzed in amplitude provide a rough localization of the events and an evaluation of the energy lost into the scintillator. Each photomultiplier can be coupled to more than one counter, reducing the number of photomultipliers and electronic channels. For instance a surface of 1200 sqm can be formed by 300 counters each 4 sqm, while the number of photomultipliers ranges from 180 to 1200 depending on the configuration. Author (ESA)

N85-29175# Rome Univ. (Italy). Dipt. di Fisica.
MEASUREMENT OF THE ATTENUATION LENGTH OF AN ACRYLIC SCINTILLATOR
W. Pecorella, L. Petrillo, and M. Severi 20 Jun. 1984 8 p
(NOTA-INTERNA-828) Avail: NTIS HC A02/MF A01

The attenuation length of an acrylic scintillator for use as a magnetic monopole detector was obtained by a fit of experimental data with a computer simulation of the light collection efficiency which takes into account the geometry of the sample. Results with and without filters are given. Author (ESA)

N85-29176# Rome Univ. (Italy). Dipt. di Fisica.
EXPERIMENTAL PERFORMANCE OF A DIGITAL CIRCUIT ABLE TO RECOGNIZE MAGNETIC MONOPOLE EVENTS
W. Pecorella, L. Petrillo, G. Salina, and M. Severi 20 Nov. 1984 26 p refs
(NOTA-INTERNA-838) Avail: NTIS HC A03/MF A01

A CAMAC digital circuit to identify slow magnetic monopoles crossing a thick scintillator counter and to reject events of any other kind, taking advantage of the different time configurations of the corresponding signals was built. Test results indicate that efficiency is very high in recognizing monopole events and in rejecting a background free from long tailed pulses, less high for a real background. However pulses of that kind can be easily identified by a time shape analysis device associated to any monopole trigger system. Author (ESA)

N85-29177# Plessey Co. Ltd., Towcester (England).
EVALUATION OF VLSI TECHNOLOGY Final Report
G. Surace, B. J. Prior, K. Beasley, D. G. Taylor, and R. S. Pengelly Paris ESA Apr. 1984 583 p refs
(Contract ESTEC-4923/81/NL-GM(SC))
(CD-6501702; ESA-CR(P)-1967) Avail: NTIS HC A25/MF A01

Silicon and GaAs VLSI parameters are tabulated. The capability of Europe, America, and Japan in VLSI technology are compared and trends are outlined. Integrated circuit (IC) custom design methodologies; gate arrays, standard cell, and full custom are highlighted and foreseen development costs with each design route are shown. Use of VLSI technology in satellite subsystems is considered. A time division multiple access system is discussed. The front end GaAs regenerative repeater and the baseband processor systems are considered with chip counts and power dissipation estimates given for each subsystem. Further systems include a multicarrier demodulator and a transmitter and soft decision receiver structures for correlative phase modulation techniques. The performance of functional blocks such as ROMs, and multipliers is studied. Work necessary to carry the subsystems to implementation in IC form, and development routes for each IC are identified. Author (ESA)

N85-29178# Telefunken Electronic G.m.b.H., Heilbronn (West Germany).
BASIC DEVELOPMENT OF ONE-CHIP CONTROL CIRCUITRY FOR COMMUTATORLESS dc MOTORS Final Report, Mar. 1984
Karl-Dieter Nutz and Roman Stromski Bundesministerium fuer Forschung und Technologie Dec. 1984 31 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-305; ISSN-0340-7608) Avail: NTIS HC A03/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 6.50

A monolithic one chip circuitry including the detection of rotor speed control and the direct load current drive of dc-motors with an electronic commutation was developed because of the increased efficiency of commutatorless dc-motors in which high-quality magnetic materials were used. The hardware demonstration of Hall-Sensor-elements in a power compatible technology was successful. A design based on the data is shown. Author (ESA)

N85-29092# Joint Publications Research Service, Arlington, Va.
BRITISH BREAKTHROUGH IN LIGHTWEIGHT LITHIUM BATTERIES
C. L. Boltz *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1984 p 23-24 Transl. into ENGLISH from Elektroniker (Aarau, Switzerland), Jul. 1984 p 103 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

N85-29096# Joint Publications Research Service, Arlington, Va.
ELECTRIC PEUGEOT TO HAVE NEW NICKEL-IRON BATTERIES
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 11-22 Transl. into ENGLISH from Wiener Zeitung (Vienna), v. 28/29, supplement, Jul. 1984 p 16 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

N85-29230*# Army Electronics Technology and Devices Lab., Fort Monmouth, N. J.
THE RUBIDIUM-CRYSTAL OSCILLATOR HYBRID DEVELOPMENT PROGRAM
John R. Vig and Vincent J. Rosati *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 157-165 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 09A

N85-29770# Standard Elektrik Lorenz A.G., Stuttgart (West Germany). Research Center.
PICOSECOND PHOTOCONDUCTIVE DEVICES FOR < 10 Gbit/s OPTOELECTRONIC SWITCHING
G. Veith *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 14 p refs Sponsored by Max-Planck-Gesellschaft, Deutsche Forschungsgemeinschaft, and Technische Univ. Wien (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N85-29179* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH THERMAL POWER DENSITY HEAT TRANSFER APPARATUS PROVIDING ELECTRICAL ISOLATION AT HIGH TEMPERATURE USING HEAT PIPES Patent
James F. Morris, inventor (to NASA) Issued 19 Mar. 1985 6 p Filed 24 Jun. 1983 Continuation-in-part of abandoned US Patent Appl-SN-202228, filed 30 Nov. 1980
(NASA-Case-LEW-12950-2; US-Patent-4,506,183;
US-Patent-Appl-SN-507626; US-Patent-Appl-SN-202228;
US-Patent-Class-310-306; US-Patent-Class-165-32;
US-Patent-Class-165-104.14) Avail: US Patent and Trademark Office CSCL 20D

This invention is directed to transferring heat from an extremely high temperature source to an electrically isolated lower temperature receiver. The invention is particularly concerned with supplying thermal power to a thermionic converter from a nuclear reactor with electric isolation. Heat from a high temperature heat pipe is transferred through a vacuum or a gap filled with electrically nonconducting gas to a cooler heat pipe. If the receiver requires gratr thermal power density, geometries are used with larger heat pipe areas for transmitting and receiving energy than the area for conducting the heat to the thermionic converter. In this way the heat pipe capability for increasing thermal power densities compensates for the comparative low thermal power densities through the electrically nonconducting gap between the two heat pipes. Official Gazette of the U.S. Patent and Trademark Office

N85-29180* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MONOGROOVE HEAT PIPE DESIGN: INSULATED LIQUID CHANNEL WITH BRIDGING WICK Patent
Joseph P. Alario, Richard F. Brown, and Robert L. Kosson, inventors (to NASA) Issued 7 May 1985 8 p Filed 30 May 1984 Sponsored by NASA
(NASA-Case-MSC-20497-1; US-Patent-4,515,207;
US-Patent-Appl-SN-615505; US-Patent-Class-165-1;
US-Patent-Class-122-366; US-Patent-Class-165-104.26) Avail: US Patent and Trademark Office CSCL 20D

A screen mesh artery supported concentrically within the evaporator section of a heat pipe liquid channel retains liquid in the channel. Continued and uniform liquid feed to the heat pipe evaporation section (20) during periods of excessive heat transfer is assured. The overall design provides high evaporation and condensation film coefficients for the working fluid by means of the circumferential grooves in the walls of the vapor channel, while not interfering with the overall heat transport capability of the axial groove. The design has particular utility in zero-g environments. Author

N85-29181*# Virginia Polytechnic Inst. and State Univ., Blacksburg.
A THREE-DIMENSIONAL TURBULENT SEPARATED FLOW AND RELATED MESUREMENTS Final Report, Apr. 1978 - Sep. 1984

F. J. Pierce Feb. 1985 8 p refs
(Grant NsG-2301)
(NASA-CR-175913; NAS 1.26:175913) Avail: NTIS HC A02/MF A01 CSCL 20D

The applicability of and the limits on the applicability of 11 near wall similarity laws characterizing three-dimensional turbulent boundary layer flows were determined. A direct force sensing local wall shear stress meter was used in both pressure-driven and shear-driven three-dimensional turbulent boundary layers, together with extensive mean velocity field and wall pressure field data. This resulted in a relatively large number of graphical comparisons of the predictive ability of 10 of these 11 similarity models relative to measured data over a wide range of flow conditions. Documentation of a complex, separated three-dimensional turbulent flow as a standard test case for evaluating the predictive ability of numerical codes solving such flows is presented. E.A.K.

N85-29182*# National Aeronautics and Space Administration. Pasadena Office, Calif.
JET PUMP-DRIVE SYSTEM FOR HEAT REMOVAL Patent Application
James R. French, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 31 May 1985 10 p
(Contract NAS7-918)
(NASA-Case-NPO-16494-1-CU; NAS 1.71:NPO-16494-1-CU; US-Patent-Appl-SN-739789) Avail: NTIS HC A02/MF A01 CSCL 20D

A jet pump, in combination with a TEMP, is employed to assure safe cooling of a nuclear reactor after shutdown. A TEMP, responsive to the heat from the coolant in the secondary flow path, automatically pumps the withdrawn coolant to a higher pressure and thus higher velocity compared to the main flow. The high velocity coolant is applied as a driver flow for the jet pump which has a main flow chamber located in the main flow circulation pump. Upon nuclear shutdown and loss of power for the main reactor pumping system, the TEMP/jet pump combination continues to boost the coolant flow in the direction it is already circulating. During the decay time for the nuclear reactor, the jet pump keeps running until the coolant temperature drops to a lower and safe temperature. At this lower temperature, the TEMP/jet jump combination ceases its circulation boosting operation. The TEMP/jet pump combination is automatic, self-regulating and provides an emergency pumping system free of moving parts. Author

N85-29183# National Aerospace Lab., Tokyo (Japan).
NUMERICAL SIMULATION OF UNSTEADY MOTION IN A TURBULENT MIXING LAYER
Kenji Inoue Dec. 1984 17 p refs
(NAL-TR-849T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Unsteady motion in a two dimensional turbulent mixing layer is simulated numerically. The time averaged Navier-Stokes equations for mean flow are used; the eddy viscosity model for turbulence is employed. The velocity fluctuation with the maximum spatial amplification rate is obtained by linearized calculation. The flow fields with the fluctuation excited by disturbances added at a fixed point with one, two, or four frequency components are calculated by the use of the finite difference approximation. Some of the features observed experimentally are reproduced, interpreted in terms of wave, and correlated with the results of the linearized calculation. Author

N85-29184# Michigan State Univ., East Lansing. College of Engineering.
TRANSVERSE VORTICITY MEASUREMENTS USING AN ARRAY OF FOUR HOT-WIRE PROBES
John F. Foss, Casey L. Klewicki, and Peter J. Disimile 12 Mar. 1985 146 p refs
(FSFL-R-006) Avail: NTIS HC A07/MF A01

A comprehensive description of the technique to obtain a time series of the quasi-instantaneous transverse vorticity from a four wire array of probes is presented. The algorithmic structure which supports the technique is described in detail and demonstration data, from a large plane shear layer, are presented to provide a specific utilization of the technique. Sensitivity calculations are provided which allow one contribution to the inherent uncertainty of the technique to be evaluated. Author

N85-29185# Wisconsin Univ., Madison. Mathematics Research Center.
INSTABILITY AT THE INTERFACE BETWEEN TWO SHEARING FLUIDS IN A CHANNEL Technical Summary Report
Y. Renardy Feb. 1985 20 p
(Contract DAAG29-80-C-0041)
(AD-A153532; MRC-TSR-2787) Avail: NTIS HC A02/MF A01 CSCL 20/4

We consider the linear stability Couette flow composed of two immiscible fluids in layers. The fluids have different viscosities but the same densities. It is known that the short wavelength asymptotics of the interfacial mode for the bounded and unbounded problems are identical. In this paper, we show that there is a critical Reynolds number above which the interfacial modes of the unbounded problem are approximated by those of the bounded problem for wavelengths outside the asymptotic short wavelength range. A full linear analysis reveals unstable situations missed out by the long and short wavelength asymptotic analyses but which have comparable orders of magnitudes for the growth rates. The inclusion of a density difference as well as a viscosity difference is discussed. In particular, the arrangement with the heavier fluid on top can be linearly stable in the presence of gravity if the viscosity stratification, volume ratio, surface tension, Reynolds number and Froude number are favorable. GRA

N85-29186# Wisconsin Univ., Madison. Mathematics Research Center.
HYPERBOLIC PHENOMENA IN THE FLOW OF VISCOELASTIC FLUIDS Technical Summary Report
D. D. Joseph Jan. 1985 93 p
(Contracts DAAG29-80-C-0041; DAAG29-82-K-0051)
(AD-A153533; MRC-TSR-2782) Avail: NTIS HC A05/MF A01 CSCL 20/4

This paper treats the problem of hyperbolicity, change of type and nonlinear wave propagation in the flow of viscoelastic fluids. Rate equations for fluids with and without instantaneous elasticity are derived and discussed. The equations of fluids with instantaneous elasticity are hyperbolic in unsteady flow and can change type in steady flow. The wave speeds depend on velocities and stresses. Some estimates of wave speeds into states of rest are given. For many of the popular models of fluids the vorticity is the field variable which changes type. The vorticity of all fluids with instantaneous elasticity can change type in motions which perturb rigid ones. Experiments and analysis exhibiting vorticity of changing type are exhibited. The linearized viscoelastic problem is governed by equations having the properties of a telegraph equation. The damping is small when the fluid is very elastic. Elastic fluids have a long memory, a large time (Weissenberg number) for relaxation. The damping is rapid when the relaxation time is small even when the flow is very supercritical. It is shown that steady flow around a body is of transonic type. The linearized problem for flow over a flat plate is reduced to an integral equation for the vorticity distribution on the plate. GRA

N85-29187# Tennessee Univ., Knoxville.
CONSTITUTIVE MODELING FOR BLAST-INDUCED WAVE PROPAGATION Final Report, Jun. - Sep. 1984
E. C. Drumm Mar. 1985 27 p
(Contract F49620-82-C-0035)
(AD-A153576; AFESC/ESL-TR-84-45) Avail: NTIS HC A03/MF A01 CSCL 19/4

The description of stress-time history acting on a buried structure is a major source of error in the analysis of underground structures to weapons loadings. The stress wave propagating spherically from the weapon is attenuated as it travels from the source. This attenuation is a function of the inelastic response of the soil, and results in an increase in the loading rise time or decrease in the loading rate. Since the inelastic soil response is a function of the loading rate, a wave propagation analysis should

be conducted to determine the stresses on the structure. At the interface between the soil and structure, the stress is modified further by soil-structure interaction effects. Thus, the stress on the structure is a function of both the structural and soil properties as well as the distance traveled by the stress wave. These related phenomena can be included in a numerical analysis, but the accuracy depends on the constitutive representation of the materials. One-dimensional wave propagation experiments and impact tests with various soils are reviewed, and the attenuation as a function of the soil stress-strain response is discussed. GRA

N85-29188# Dynamics Technology, Inc., Torrance, Calif.
ON THE ORIGIN OF STREAMWISE VORTICES IN A TURBULENT BOUNDARY LAYER Final Report
P. S. Jang, D. J. Benny, and R. L. Gran Mar. 1985 34 p
(Contract N00014-81-C-0440)
(AD-A153651; AD-F300606; DT-8154-06) Avail: NTIS HC A03/MF A01 CSCL 20/4

Several experiments have suggested that the streamwise vortices, with their accompanying low momentum streaks, in a turbulent boundary layer have a characteristic spanwise wavelength of approximately lambda (superscript + subscript z) = 100. A mechanism is proposed which selects a comparable spanwise wavelength and produces counterrotating streamwise vortices in a turbulent boundary layer. Examining the equations which describe the small deviation of the velocity field from its time-average, it is found that the Benney-Gustavsson resonance (Studies in Applied Mathematics 3, 1981) occurs with such a boundary layer velocity profile. It is shown that, as an integral part of this resonance, there is a mean secondary flow which has a spanwise wavelength lambda (superscript +, subscript z) = 90 and whose velocities exhibit a counter-rotating streamwise vortex structure. GRA

N85-29189# Dayton Univ., Ohio.
TIME-AVERAGED AND TIME-DEPENDENT COMPUTATIONS OF ISOTHERMAL FLOWFIELDS IN A CENTERBODY COMBUSTOR Final Report, 15 Jun. 1982 - 15 Jun. 1984
L. Krishnamurthy, M. S. Raju, M. J. Creed, and J. N. Memering Wright-Patterson AFB, Ohio AFWAL Dec. 1984 203 p
(Contract F33615-82-K-2252)
(AD-A153682; UDR-TR-84-88; AFWAL-TR-84-2081) Avail: NTIS HC A10/MF A01 CSCL 20/4

A numerical investigation of the near-wake region in a ducted bluff-body combustor by finite-difference computations is reported. The numerical predictions are based upon: (1) the Reynolds-averaged Navier Stokes equations and the k-epsilon turbulence model; and (2) the time-dependent, compressible Navier-Stokes equations, The standard K-epsilon turbulence model was modified to account for the effect of streamline curvature and for the preferential influence of normal stresses. The time-averaged calculations addressed the turbulent mixing under isothermal conditions in: (1) the large and small-scale centerbody combustor configurations, due to annular air flow and central CO2 flow; and (2) the two-dimensional mixing-layer configuration, due to two streams of nitrogen at different velocities. The time-dependent calculations addressed the near-wake flowfield of the large-scale centerbody combustor configuration with only the annular air stream present. The Reynolds-averaged predictions examined the influence of the turbulence model corrections and geometric scale under varying annular and central flows on: (1) the axial and radial distributions of the mean and fluctuating components of the axial and radial velocities and of the mean CO2 concentrations; and (2) the axial and the radial locations of the vortex center, as well as the magnitude and location of the minimum centerline mean axial velocity. Comparison of the predicted results with experimental data emphasizes and clarifies the complex flowfield interactions of the recirculating near-wake region. GRA

N85-29190# Naval Research Lab., Washington, D. C. Fluid Dynamics Branch.
TURBULENT WAKE OF A SUBMERGED FLAT PLATE Memorandum Report, Nov. 1981 - Nov. 1984
A. L. Cooper 11 Apr. 1985 97 p refs
(AD-A153776; NRL-MR-5521) Avail: NTIS HC A05/MF A01 CSCL 20/4

The turbulent wake of a two-dimensional, submerged flat plate is calculated by means of a parabolic, two-equation, k-epsilon model. The general turbulence model considered involves standard k and epsilon equations and possess the capability for free-surface proximity effect terms through an algebraic stress model for the Reynolds stress equation. This type of model along with an enhanced Dirichlet type boundary condition for the dissipation at the free surface has been successful in applications to open channel flow but it is found to be unsatisfactory for the submerged wake application. Both the proximity terms and the enhanced dissipation boundary condition lead to reduced wake drag when compared with recent experiments. A standard k-epsilon eddy viscosity model with adjusted model parameters and symmetric boundary conditions at the free-surface best describes the wake application. Model parameter sets for application to deep and shallow submerged wakes are optimized by comparing the predictions with the recent experiments of Swean and Keramidas. A parameter set with enhanced epsilon diffusivity and retarded k diffusivity seems to provide best agreement with the experimental profiles. The systematic wake drift toward the free-surface which has been observed experimentally is not predicted although excellent agreement is obtained when the predicted profiles are shifted in accordance with the experimental drift observations. GRA

N85-29191# Army Military Personnel Center, Alexandria, Va.
COMPUTER-AIDED THERMOHYDRAULIC DESIGN OF TEMA TYPE E SHELL AND TUBE HEAT EXCHANGERS FOR USE IN LOW PRESSURE, LIQUID-TO-LIQUID, SINGLE PHASE APPLICATIONS Final Report
N. J. Kolar 1 Apr. 1985 185 p
(AD-A153779) Avail: NTIS HC A09/MF A01 CSCL 13/1

Classification, nomenclature, utilization and cost estimating of shell and tube heat exchangers are presented along with an historical overview of various methods currently employed in their design. A procedure for providing preliminary estimates of shell and tube heat exchanger design is developed in detail. The author formulates a computer program which employs this sizing algorithm for low pressure liquid-to-liquid heat exchanger applications. Additionally, problems encountered in the design and manufacture of shell and tube heat exchangers are described along with present methods of solution for each. GRA

N85-29192# Naval Research Lab., Washington, D. C. Lab. for Computational Physics.
THE HYDROSYNCLASTIC INFUNDIBULUM Interim Report
D. L. Brook 29 Apr. 1985 14 p
(AD-A153849; NRL-MR-5569) Avail: NTIS HC A02/MF A01 CSCL 20/4

The possibility of setting up a water vortex inside a convergent axisymmetric duct is investigated, with a view toward applications to a proposed high-density-gas-enclosed Z-pinch experiment. GRA

N85-29193# Dayton Univ., Ohio.
THE METHOD OF RESIDUAL MINIMIZATION IN COMPRESSIBLE STEADY FLOWS Interim Report, Mar. 1983 - Jun. 1984
Karl G. Guderley Wright-Patterson AFB, Ohio AFWAL Apr. 1985 255 p refs
(Contract F33615-83-K-3207)
(AD-A153924; UDR-TR-84-46; AFWAL-TR-85-3002) Avail: NTIS HC A12/MF A01 CSCL 20/4

Theoretical aspects of residual minimization in transonic flows are discussed for different formulations of the basic equations. By a special choice of the metric in function space, one de-emphasizes short wave errors which are technically less important but cause slow convergence. Far field conditions are included in the approach by considering the distant (noncomputed) flow field as a superelement characterized by shape functions which solve the linearized equations. The matching of the three dimensions between the distant flow field and the computer part poses a difficult problem.

A simple example shows a rather strong propagation of matching errors. Wake capturing can be accomplished even if one retains in nearly all of the flow field the idea of a potential flow. Linearized examples for supersonic problems give some insight in the questions of stability and accuracy. GRA

N85-29194# California Inst. of Tech., Pasadena. Graduate Aeronautical Labs.
DYNAMICS OF VAPOR EXPLOSIONS Final Report, 1 Jan. 1983 - 31 Dec. 1984
B. Sturtevant 8 Aug. 1984 18 p refs
(Contract DE-AT03-80ER-10634)
(DE85-008845; DOE/ER-10634/T1) Avail: NTIS HC A02/MF A01

A great deal was learned about the behavior of the intrinsic interfacial instability of rapid vaporization, a violent instability which is responsible for the destructiveness of vapor explosions. An investigation of the effect of ambient pressure on the instability has been completed, and it has been shown that the instability may be completely suppressed by increasing the pressure. The suppression is simply due to a substantial reduction of the preinstability vaporization rate with increasing pressure, because the degree of superheating at the superheat limit decreases as the critical point is approached. It was discovered during the investigation of the pressure dependence that a transitional regime, in which the instability is marginal, is ideal for exhibiting many of the properties of the instability. DOE

N85-29195# California Univ., Livermore. Lawrence Livermore Lab.
VARIATIONAL BOUNDS ON DARCY'S CONSTANT
J. G. Berryman Feb. 1985 36 p refs Presented at the Workshop on Homogenization and Effective Moduli of Mater. and Media, Minneapolis, 22 Oct. 1984 Previously announced as N85-25916
(Contract W-7405-eng-48)
(DE85-008959; UCRL-91882-Rev-1; CONF-8410231-1-Rev-1) Avail: NTIS HC A03/MF A01

Prager's varitional method of obtaining upper bounds on the fluid permeability (Darcy's constant) for slow flow through porous media is reexamined. By exploiting the freedom one has in choosing the trial stress distributions, several new results are derived. One result is a phase interchange relation for permeability; when the fluid-phase and particle-phase are interchanged for a fixed geometry, we find an upper bound on a linear combination of the complementary permeabilities. DOE

N85-29196# California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering.
DIFFUSION OF GASES IN POROUS SOLIDS: SIMULATION AND MEASUREMENTS Quarterly Progress Report, 16 Oct. 1984 - 15 Jan. 1985
J. W. Evans 1985 4 p
(Contract DE-FG22-82PC-50796)
(DE85-008870; DOE/PC-50796/T8; QPR-10) Avail: NTIS HC A02/MF A01

Progress was made on the theoretical aspects of this research. A number of Monte Carlo simulations for ordinary gas diffusion in Swiss cheese solids were completed. The results are plotted in the attached figure along with results for simulations of diffusion in cannonball solids. Also included in this figure are classical theoretical curves for transport in heterogeneous media. The results of the Monte Carlo simulations agree well with the classical theories. It should be noted that the simulation results and the classical theories are at odds with two frequently used correlations for the tortuosity factor, T, purporting to represent gaseous diffusion in porous solids: T = 1/E, where E = porosity and T = 1/E(2). DOE

N85-29197# California Univ., Santa Barbara. Dept. of Physics.
PATTERN SELECTION AND INSTABILITY IN NONLINEAR WAVE EQUATION: AN ASPECT OF SOLITON AND CHAOS
Masatoshi Imada 1985 6 p refs Presented at the Conf. on Solitons and Coherent Struct., Santa Barbara, Calif., 11 Jan. 1985
(Contract W-7405-eng-36)
(DE85-009578; LA-UR-85-848; CONF-850165-2) Avail: NTIS HC A02/MF A01

Pattern selection problems are found in a variety of phenomena. Fluid dynamic systems and nonlinear diffusion phenomena give examples of pattern formation problems in dissipative systems. In some cases the dissipation reduces the effective dimension of the system, which leads to several strikingly universal behaviors which were initially found in simple model systems with a few degrees of freedom. Nonlinear wave equations describe systems without dissipation in which the situation is more complicated. Many completely intergrating systems are known in nonlinear wave equations, where neither ergodicity nor chaos is expected. With addition of small perturbation to completely integrable systems, the growth of instability and the role of coherent structures in the pattern selection problem is observed. Two of these aspects are discussed. DOE

N85-29198# Stanford Univ., Calif.
TRANSPORT CHARACTERISTICS OF SLURRIES IN PIPELINES: FLOW REGIMES AND PRESSURE DROP Final Report
Andreas Acrivos Mar. 1985 27 p refs
(Contract DE-AT03-80ER-10659)
(DE85-009453; DOE/ER-10659/T1) Avail: NTIS HC A03/MF A01

Unrelated phenomena pertaining to the rheology of concentrated suspensions are discussed. Explanations that shed new light on the understanding of such systems are provided. The principal phenomena in question are: (1) the observed resuspension of a settled bed of particles in a viscous fluid upon being sheared, (2) the existence of a shear induced anisotropy in a concentrated suspension which manifests itself in measurable normal stresses; and (3) slow decay with time of the effective viscosity of a concentrated suspension, as measured in a Couette viscometer, together with a shear thinning behavior in such systems. Evidence is provided which proves that these phenomena arise as a result of the existence of shear induced diffusion mechanism which produces a flux of particles from regions of high particle concentration to low, or from regions of high shear to low. The overall goal of this combined experimental and theoretical program is a theoretical framework, currently lacking, for modelling the flow behavior of concentrated suspensions quantitatively. DOE

N85-29199# California Univ., Berkeley. Dept. of Chemical Engineering.
DYNAMICS OF THIN-FILM BREAKUP IN A CONSTRICTED PORE
P. A. Gauglitz and C. J. Radke 1985 17 p refs Presented at Spring Natl. Meeting of AIChE, Houston, Tex., 24 Mar. 1985
(Contract DE-AC03-76SF-00098)
(DE85-008442; LBL-18947; CONF-850357-3) Avail: NTIS HC A02/MF A01

To understand foam formation in porous media, the dynamics of a wetting liquid film forming an unstable collar (or collars) in a constricted cylindrical tube are considered. A hydrodynamic lubrication analysis is presented to describe the time evolution of a thin viscous film under the influence of surface tension and conjoining or disjoining forces. Time to breakup depends on the pore shape, the strength of the conjoining or disjoining force, the initial film profile, and also, the fluid viscoisty, interfacial tension, and unconstricted pore radius which combine to form a characteristic scaling time. Agreement is found between breakup times predicted from the hydrodynamic analysis, and from 16 mm movies taken of the breakup phenomena over a wide range of initial film thicknesses. DOE

N85-29200# Sandia Labs., Albuquerque, N. Mex.
IN SITU TUFF WATER MIGRATION/HEATER EXPERIMENT Final Report
J. Keith Johnstone, G. Ronald Hadley, and David R. Waymire Mar. 1985 119 p refs
(Contract DE-AC04-76DP-00789)
(DE85-010415; SAND-81-1918) Avail: NTIS HC A06/MF A01

The results of the In Situ Tuff Water Migration/Heater Experiment operated in the welded portion of the Grouse Canyon Member of the Belted Range Tuff in U12g-tunnel (G-Tunnel) on the Nevada Test Site are summarized. The experiment was located approximately 400 m below the surface and 200 m above the water table in nearly saturated rock. The experiment was designed to provide an initial assessment of the thermally induced behavior of the potentially large volumes of water (approx. 25 vol % in this case) available in saturated or nearly saturated tuffaceous rocks. Instruments in the water collection cavities, including water depth gages, pH probes, humidity gages, and pressure transducers measured some properties of the collected water. Other holes in the array were instrumented to measure temperature profiles, thermally induced stress, and one provided a test bed for a continuously operating laser interferometer for measuring thermally induced rock displacements. Initial analysis of the water generation rate data in the heater hole, assuming a one-dimensional evaporation front/vapor diffusion model, provided good qualitative agreement. DOE

N85-29201# Terra Tek, Inc., Salt Lake City, Utah.
LABORATORY INVESTIGATION OF FORMATION DAMAGE OF AN ARTIFICIAL FRACTURE AT SIMULATED GEOTHERMAL CONDITIONS Final Report
K. C. Rakop, R. W. Winzenried, and E. Peterson Mar. 1985 100 p refs
(Contract DE-AC07-77ET-28301)
(DE85-010301; DOE/ET-28301/T1; TR-85-24) Avail: NTIS HC A05/MF A01

Formation damage mechanisms in a fracture-dominated geothermal reservoir were investigated through the use of simulated fractures. The experiments systematically investigated fracture conductivity impairment resulting from exposure to three discrete fluid systems known to be sources of formation damage. The fluids used included: a clear brine containing suspended solids representative of those produced during drilling; two clear brines of incompatible chemical composition which, when intermingled, produce carbonate scaling and precipitation; and a colloidal drilling fluid containing bentonite clay as the colloid. The test program concentrated on fracture conductivity impairment, not matrix permeability impairment. The test procedures were designed to simulate the infiltration of drilling fluid into the natural fractures of the geothermal reservoir system. DOE

N85-29202# California Univ., Livermore. Lawrence Livermore Lab.
APPLICATIONS OF CANUTO'S METHOD TO RAYLEIGH-TAYLOR-INITIATED TURBULENCE
Carol T. Alonso 28 Feb. 1985 18 p refs
(Contract W-7405-eng-48)
(DE85-010835; UCID-20406) Avail: NTIS HC A02/MF A01

The recently published method of Canuto and Goldman for estimating large scale turbulent energies from instability growth rates was applied to Rayleigh-Taylor initiated turbulence. Simple closed expressions were derived for the kinetic energy spectrum of turbulent eddies and the total kinetic energy. The results depend very much on the smallest realizable wavenumber; that is, all the energy lies in the largest eddies. Calculations based on this model indicate that for systems of the order of centimeters, the total turbulent kinetic energy density can be considerably greater than the translational kinetic energy of the perturbed interface, for interface velocities of the order of a few cm/sec or greater. Thus, the turbulent energy substantially impacts the energy balance of such systems. Applications exist in many laboratory and astrophysical cases of general interest. DOE

N85-29203# Louisiana State Univ., Baton Rouge. Office for Research.
TECHNICAL SUPPORT FOR GEOPRESSURED-GEOTHERMAL WELL ACTIVITIES IN LOUISIANA Annual Report, 1 Nov. 1982 - 31 Oct. 1983
31 Oct. 1984 175 p refs
(Contract DE-AC08-81NV-10174)
(DE85-010462; DOE/NV-10174/4) Avail: NTIS HC A08/MF A01

Environmental monitoring of microseismic activity, land-surface elevations, and surface and ground-water quality at three designed geopressured-geothermal test well sites in Louisiana is described. DOE

N85-29204# California Univ., Livermore. Lawrence Livermore Lab. Electronics Engineering Dept.
AUTOMATIC VOLUME CALIBRATION SYSTEM
Alan J. Gates and Carl C. Aaron 6 May 1985 30 p refs Presented at the 31st Intern. Instr. Symp. of the Instr. Soc. of Am., San Diego, Calif., 6 May 1985
(Contract W-7405-eng-48)
(DE85-008955; UCRL-91609; CONF-850582-7) Avail: NTIS HC A03/MF A01

The Automatic Volume Calibration System consists of three independent volume-measurement subsystems and can possibly be expanded to five subsystems. When completed, the system will manually or automatically perform the sequence of valve-control and data-acquisition operations required to measure given volumes. An LSI-11 minicomputer controls the vacuum and pressure sources and controls solenoid control valves to open and close various volumes. The input data are obtained from numerous displacement, temperature, and pressure sensors read by the LSI-11. The LSI-11 calculates the unknown volume from the data acquired during the sequence of valve operations. The results, based on the Ideal Gas Law, also provide information for feedback and control. DOE

N85-29205# EG and G Energy Measurements, Inc., Las Vegas, Nev.
PRESSURE MEASUREMENT: SHORT COURSE
Roger P. Noyes 1985 61 p refs Presented at the 31st ISA Intern. Instrumentation Symp., San Diego, Calif., 6-9 May 1985
(Contract DE-AC08-83NV-10282)
(DE85-008644; EGG/10282-1077; CONF-850582-4) Avail: NTIS HC A04/MF A01

The measurement of pressure in static and flow fluids and the measurement of dynamic pressures are covered, as well as calibration of pressure transducers, criteria for selection of pressure transducers, and operation principles of pressure transducers. DOE

N85-29206# Mechanical Technology, Inc., Latham, N. Y.
TECHNOLOGY FOR INDUSTRIAL WASTE HEAT RECOVERY BY ORGANIC RANKINE CYCLE SYSTEMS Final Report
W. G. Cain, R. L. Drake, and C. J. Prisco Oct. 1984 200 p
(Contract DE-AC07-82ID-12399)
(DE85-006719; MTI-84/TR-4) Avail: NTIS HC A09/MF A01

The recovery of industrial waste heat and the conversion thereof to useful electric power by use of Rankine cycle systems is studied. Four different aspects of ORC technology were studied: possible destructive chemical reaction between an aluminum turbine wheel and R-113 working fluid under wheel-to-rotor rub conditions; possible chemical reaction between stainless steel or carbon steel and any of five different ORC working fluids under rotor-stator rub conditions; effects on electric generator properties of extended exposure to an environment of saturated R-113 vapor/fluid; and operational proof tests under laboratory conditions of two 1070 kW, ORC, R-113 hermetic turbogenerator power module systems. Author

N85-29207# Sandia Labs., Albuquerque, N. Mex. Analytical Solid Mechanics Div.
DYNAMIC STABILITY OF A SPINNING TUBE CONVEYING A FLOWING FLUID
G. A. Benedetti Feb. 1985 34 p refs
(Contract DE-AC04-76DR-00789)
(DE85-007583; SAND-84-8703) Avail: NTIS HC A03/MF A01

When a fluid flows inside a tube, the deformations of the tube can interact with the fluid flowing within it and these dynamic interactions can result in significant lateral motions of the tube and the flowing fluid. The purpose is to examine the dynamic stability of a spinning tube through which an incompressible fluid

is flowing. The tube can be considered as either a hollow beam or as a hollow cable. The coupled partial differential equations are determined for the lateral motion of a spinning Bernoulli-Euler beam or a spinning cable carrying an incompressible flowing fluid. The Galerkin method is used to reduce the coupled partial differential equations for the lateral motion of the spinning beam to a coupled set of 2N, second order, ordinary differential equations for the generalized beam coordinates. By simplifying these equations and examining the roots of the characteristic equation, an analytical solution is obtained for the lateral dynamic instability of the beam or cable. DOE

N85-29208# Martin Marietta Labs., Baltimore, Md.
UNSYMMETRICAL FLOW IN A CENTRIFUGE
S. H. Maslen Sep. 1984 11 p refs
(Contract DE-AC05-82OR-20900)
(DE85-009021; UVA-ER-953-84U) Avail: NTIS HC A02/MF A01

The differential equations for a centrifuge sector are discussed in which cylinder whose cross section is a slice of pie is presumed to be mud. Three boundary layers are considered: the cylindrical wall layer, Ekman layers at the ends and the buoyancy layers on the theta = constant walls. It is suggested that the cylinder is most of the time infinitely long, and that the atmospheric scale height is of the order of the bowl radius all of the time. Both restrictions are relaxed. DOE

N85-29209# Research Inst. of National Defence, Umea (Sweden). Dept. 4.
TWO PHASE DISCHARGE OF LIQUEFIED GASES THROUGH PIPES. FIELD EXPERIMENTS WITH AMMONIA AND THEORETICAL MODEL
Kenneth Nyren and Stellan Winter Jan. 1984 15 p refs Presented at IChemE Symp. on Loss Prevention, Harrogate, Engl., 1983
(Proj. W431)
(FOA-B-40139-C1; ISSN-0281-0263) Avail: NTIS HC A02/MF A01

Field experiments with full scale releases of pressurized through siphon pipes from a storage tank were performed. It is found that the flow is a damped critical flow causing a violent turbulent spray jet. The pronounced atomization of the liquid and the quick air entrainment prevent rainout and no traces of land spills are observed. A theoretical model is also presented. Comparisons with the field experiments and laboratory experiments show that the model gives very good predictions of the mass flow rate and the jet determining parameters. The model is useful also for long pipe systems as it takes into account friction and other resistances.
Author (ESA)

N85-29210# Technische Univ., Berlin (West Germany). Inst. fuer Wasserbau und Wasserwirtschaft.
EXPERIMENTAL INVESTIGATIONS OF THE UNSTEADY TURBULENT FRICTION BEHAVIOR WITH PRESSURE IMPULSES IN A CIRCULAR PIPE [EXPERIMENTELLE UNTERSUCHUNGEN UEBER DAS INSTATIONAERE TURBULENTE REIBUNGSVERHALTEN BEI AUFGEPRAEGTEN DRUCKIMPULSEN IN EINER ROHRLEITUNG MIT KREISQUERSCHNITT]
Hartmut Arlt 1983 148 p refs In GERMAN Sponsored by Deutsche Forschungsgemeinschaft
(IWAWI-Mitt-102; ISSN-0409-1744) Avail: NTIS HC A07/MF A01

Transient pressure changes are studied to analyze unsteady wall tension with turbulent nonperiodic flow changes and for comparison with oscillating flow parameters in a 80 m long, 0.0092 m internal diameter pipe filled with water. The unsteady friction impact is reflected in the deformation of the pressure wave. The weighting function depends on the transition time and on the maximum pressure amplitude. The unsteady wall shear stress depends on the frequency and the Reynolds number. The unsteady friction behavior with a transient pipe flow is similar to the oscillation behavior in a turbulent oscillating flow. Author (ESA)

N85-29211# Pfaudler-Werke A.G., Schwetzingen (West Germany).
DEVELOPMENT OF CORROSION RESISTANT HEAT EXCHANGERS FOR FLUE GAS DESULFURIZATION Final Report, Apr. 1984
Erich Ernst and Rolf Lorentz Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 71 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-281; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15

A glass lining as protection against corrosion in flue gas desulfurization plants was developed. Glasses were evaluated under corrosive attack of fluoride-containing acids. The corrosion properties of one-layer and two-layer glass enamels are optimized. Two-layer systems always show better resistance and longer life. The optimized glass linings were tested in a power plant. Manufacturing principles for glass-lined heat exchanger elements are derived. The optimized glasses may be used as protective lining design for heat exchangers or parts of them. Author (ESA)

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N85-29212* National Aeronautics and Space Administration. Pasadena Office, Calif.
TRACE WATER SENSOR Patent
James B. Stephens (JPL, Pasadena, Calif.), Mary M. Yang (JPL, Pasadena, Calif.), and Eric G. Laue, inventors (to NASA) (JPL, Pasadena, Calif.) Issued 30 Apr. 1985 6 p Filed 14 Jan. 1983 Sponsored by NASA
(NASA-Case-NPO-15722-1; US-Patent-4,514,178; US-Patent-Appl-SN-457992; US-Patent-Class-204-430; US-Patent-Class-204-1T; US-Patent-Class-73-336.5) Avail: US Patent and Trademark Office CSCL 14B

A solid electrolytic type hygrometer is described, which operates with high reliability while providing rapid and sensitive response. A gold foil electrode is wrapped about a hollow glass cylinder, a sheet of hydroscopic-electrolytic material is wrapped about the foil, and a wire is wound around the outside of the electrolytic sheet. Moisture passing between wire turns can be absorbed by the electrolytic material, and then dissociated by current passed by the electrodes through the electrolytic material. The cylinder has a slit extending along its length, to allow resilient expansion to press the sheet of electrolytic material firmly against the electrodes. The wire turns lie against one another to cause rapid dissociation of moisture throughout the electrolytic material. Additional guard wires lie at opposite ends of the electrolytic sheet, and currents pass through them to avoid moisture buildup at the ends of the main wire coil.
Official Gazette of the U.S. Patent and Trademark Office

N85-29213* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MOISTURE CONTENT AND GAS SAMPLING DEVICE Patent
Herman C. Krieg, Jr., inventor (to NASA) (TRW, Inc., Redondo Beach, Calif.) Issued 7 May 1985 14 p Filed 19 Feb. 1982 Sponsored by NASA
(NASA-Case-MSC-18866-1; US-Patent-4,515,751; US-Patent-Appl-SN-350471; US-Patent-Class-422-86; US-Patent-Class-422-103; US-Patent-Class-422-88; US-Patent-Class-436-2; US-Patent-Class-73-40.7; US-Patent-Class-73-863.86; US-Patent-Class-73-864.52) Avail: US Patent and Trademark Office CSCL 14B

An apparatus is described for measuring minute quantities of moisture and other contaminants within sealed enclosures such

as electronic assemblies which may be subject to large external atmospheric pressure variations. An array of vacuum quality valves is arranged to permit cleansing of the test apparatus of residual atmospheric components from a vacuum source. This purging operation evacuates a gas sample bottle, which is then connected by valve settings to provide the drive for withdrawing a gas sample from the sealed enclosure under test into the sample bottle through a colometric detector tube (Drager tube) which indicates moisture content. The sample bottle may be disconnected and its contents (drawn from the test enclosure) separately subjected to mass spectrograph analysis.
Official Gazette of the U.S. Patent and Trademark Office

N85-29214* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LOW GRAVITY EXOTHERMIC HEATING/COOLING APPARATUS Patent
Richard M. Poorman, inventor (to NASA) Issued 30 Apr. 1985 7 p Filed 18 Mar. 1982 Sponsored by NASA
(NASA-Case-MSC-25707-1; US-Patent-4,513,810;
US-Patent-Appl-SN-359627; US-Patent-Class-165-61;
US-Patent-Class-126-263; US-Patent-Class-244-163;
US-Patent-Class-165-64; US-Patent-Class-165-48R) Avail: US Patent and Trademark Office CSCL 14B

A low gravity exothermic heating/cooling apparatus is disclosed for processing materials in space which includes an insulated casing and a sample support carried within the casing which support a sample container. An exothermic heat source includes a plurality of segments of exothermic material stacked one upon another to produce a desired temperature profile when ignited. The sample container is arranged within the core of the stacked exothermic heating material. Igniters are spaced vertically along the axis of the heating material to ignite the exothermic material at spaced points to provide total rapid burn and release of heat. To rapidly cool and quench the heat, a source of liquid carbon dixoide is provided which is conveyed through a conduit and a metering orifice into a distribution manifold where the carbon dioxide is gasified and dispersed around the exothermic heating material and the sample container via tubes for rapidly cooling the material sample. Author

N85-29215 Metals Society, London (England).
AUTOMATIC LIQUID-METAL TEMPERATURE MONITORING WITH THE USE OF IMMERSED TRANSDUCERS
R. A. Simaryan 29 Mar. 1984 8 p refs Transl. into ENGLISH from Stal (USSR), v. 8, 1983 p 45-46
(BLL-BISI-Trans-22427-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10; overseas $22.50

A procedure for building up a system for the digital monitoring of liquid metal temperature is considered. The system, based on the use of immersed thermoelectric transducers, has been introduced in a converter shop and is in successful use for monitoring steel temperature in the vessel on turndown and in the ladle during treatment with inert gas and hot metal temperature during converter charging. Author

N85-29216*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VIBRATION-FREE RAMAN DOPPLER VELOCIMETER Patent Application
Reginald J. Exton, inventor (to NASA) Filed 25 Apr. 1985 15 p
(NASA-Case-LAR-13268-1; NAS 1.71:LAR-13268-1;
US-Patent-Appl-SN-727034) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and apparatus unaffected by vibrational environments for obtaining measurements using Raman Doppler Velocimetry is described. Two laser beams, a pump beam and a probe beam, are focused by a lens to a point in a flow. A lens collimates the two beams. A beam splitter dumps beam and the other beam is reflected by a corner cube back to lens. The other lens then focuses the beam back to the point. The reflected beam and the backward and forward scattering at the point are detected by a detector and processed by a boxcar averager. The lens and corner cube combination, called a retrometer ensure that the measurements are unaffected by vibrations. Author

N85-29217*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OSCILLATING PRESSURE DEVICE FOR DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS Patent Application
Robert W. Hess, Pamela A. Davis, and William T. Davis, inventors (to NASA) Filed 14 Mar. 1985 8 p
(NASA-Case-LAR-13094-1; NAS 1.71:LAR-13094-1;
US-Patent-Appl-SN-711551) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and apparatus for obtaining dynamic calibrations of pressure transducers is presented. A calibration head, a flexible tubing and a bellows enclose a volume of air at atmospheric pressure with a transducer to be calibrated subject to the pressure inside the volume. All of the other apparatus applies oscillations to the bellows causing the volume to change thereby applying oscillating pressures to the transducer whereby the transducer can be calibrated. Author

N85-29218*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLOW THROUGH BACTERIA DETECTION SYSTEM Patent Application
Judd R. Wilkins and David C. Grana, inventors (to NASA) Filed 4 Apr. 1985 21 p
(NASA-Case-LAR-12871-1; NAS 1.71:LAR-12871-1;
US-Patent-Appl-SN-719797) Avail: NTIS HC A02/MF A01 CSCL 06B

A microbial detection system that automatically collects, incubates, and enumerates the micro-organisms within a water sample in a few hours, then sterilizes the system in order to prepare the system for another sample, is disclosed. Initially, the system is sterilized and then purged to remove residual organisms from the previous test. The sample is collected in accumulator until it reaches a predetermined level when intake valve is opened forcing the sample into incubator. The growth media is then introduced into incubator and the system is incubated for a duration dependent on the number of test organisms. Finally, the sample is dumped and the entire process is repeated for a new sample. The sample intake valve employs a unique combination of concentric dome valves and valve stems which are solenoid operated. The concentric dome valves provide a fluid intake port capable of reliable sterilization between sample intakes. Author

N85-29219*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUIDIC ANGULAR VELOCITY SENSOR Patent Application
C. Martin Berdahl (JPL, Pasadena, Calif.) Filed 4 Apr. 1985 19 p
(Contract NAS7-918)
(NASA-Case-NPO-16479-1-CU; NAS 1.71:NPO-16479-1-CU;
US-Patent-Appl-SN-719794) Avail: NTIS HC A02/MF A01 CSCL 14B

A fluidic sensor providing a differential pressure signal proportional to the angular velocity of a rotary input is described. In one embodiment the sensor includes a fluid pump having an impeller coupled to a rotary input. A housing forming a constricting fluid flow chamber is connected to the fluid input of the pump. The differential pressure signal measured across the flow restrictive input is relatively noise free and proportional to the square of the angular velocity of the impeller. In an alternative embodiment, the flow chamber has a generally cylindrical configuration and plates having flow restrictive apertures are disposed within the chamber downstream from the housing port. In this embodiment, the differential pressure signal is found to be approximately linear with the angular velocity of the impeller. Author

N85-29220# National Aerospace Lab., Tokyo (Japan).
STUDY ON A FLEXURE HINGED PENDULUM ACCELEROMETER
Takao Suzuki, Masao Otsuki, and Shigeharu Enkyo 1984 23 p

refs In JAPANESE; ENGLISH summary
(NAL-TR-844; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

Problems of the two types of floated pendulum accelerometers formerly developed by the authors are discussed. In one of the accelerometers the pendulum in a cylindrical float was supported with pivots and jewels of the output axis, and in the other accelerometer by means of a magnetically centering technique. In order to solve the problem, a Flexure Hinged Pendulum Accelerometer (FHPA) was developed, in which a flat shaped pendulum was supported with a pair of friction free flexure hinges. This paper describes the principle of operation, goal accuracy, design of the main components (pendulum, pickoff, torquer, damper, and servo amplifier) and also the results of the performance tests. B.W.

N85-29221*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCEEDINGS OF THE SIXTEENTH ANNUAL PRECISE TIME AND TIME INTERVAL (PTTI) APPLICATIONS AND PLANNING MEETING
1984 488 p refs Meeting held in Greenbelt, Md., 27-29 Nov. 1984; sponsored in cooperation with Naval Observatory, Naval Electronic Systems Command, NRL, Defense Communications Agency, Chief of Naval Operations, NBS, Army Electronics Technology, and RADC
(NASA-TM-87561; NAS 1.15:87561) Avail: NTIS HC A21/MF A01 CSCL 14B

The effects of ionospheric and tropospheric propagation on time and frequency transfer, advances in the generation of precise time and frequency, time transfer techniques and filtering and modeling were among the topics emphasized. Rubidium and cesium frequency standard, crystal oscillators, masers, Kalman filters, and atomic clocks were discussed. For individual titles, see N85-29222 through N85-29252.

N85-29222*# Paris-Sud Univ., Orsay (France). Lab. de l'Horloge Atomique.
PROSPECTS FOR ATOMIC FREQUENCY STANDARDS
C. Audoin *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 1-47 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

The potentialities of different atomic frequency standards which are not yet into field operation, for most of them, but for which preliminary data, obtained in laboratory experiments, give confidence that they may improve greatly the present state of the art are described. The review will mainly cover the following devices: (1) cesium beam frequency standards with optical pumping and detection; (2) optically pumped rubidium cells; (3) magnesium beam; (4) cold hydrogen masers; and (5) traps with stored and cooled ions. Author

N85-29223*# National Bureau of Standards, Boulder, Colo.
FREQUENCY AND TIME STANDARDS BASED ON STORED IONS
J. J. Bollinger, D. J. Wineland, W. M. Itano, J. C. Bergquist, and J. D. Prestage *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 49-58 refs Sponsored in part by AFOSR and ONR (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

The method of ion storage provides a basis for excellent time and frequency standards. This is due to the ability to confine ions for long periods of time without the usual perturbations associated with confinement (e.g., wall shifts). In addition, Doppler effects can be greatly suppressed. The use of stored ions for microwave frequency standards and the future possibilities for an optical frequency standard based on stored ions are addressed. Author

N85-29224*# National Research Council of Canada, Ottawa (Ontario). Electrical and Time Standards Section.
ON THE ACCURACY OF Cs BEAM PRIMARY FREQUENCY STANDARDS
J.-S. Boulanger, R. J. Douglas, J. Vanier, A. G. Mungall, Y. S. Li, and C. Jacques *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 59-80 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

A new and much more exact method for evaluation of the velocity distribution in 10 to the 15th power of the frequency of the clock. It seems feasible to improve the accuracy even further with better measurements. The evaluation of the C-field, however, is still limited to a few parts in 10 to the 14th power because of the uncertainties linked to the method used, and this uncertainty remains one of the major limitations of NRC's primary clocks. Author

N85-29225*# Duke Univ., Durham, N. C.
METHODS TO RECOVER THE NARROW DICKE SUB-DOPPLER FEATURE IN EVACUATED WALL-COATED CELLS WITHOUT RESTRICTIONS ON CELL SIZE
H. G. Robinson *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 81-89 refs Sponsored in part by Duke Univ., Research Council (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

The hyperfine resonance observed in evacuated wall-coated cells with dimensions > lambda/2 (lambda is the hyperfine resonance wavelength) consists of a narrow Dicke sub-Doppler linewidth feature, the spike, superimposed on a broad pedestal. The hydrogen maser provides a classic example of this lineshape. As cell size is increased, an effect unique to evacuated wall-coated cells occurs. Certain combinations of microwave field distribution and cell size result in a lineshape having a pedestal with a small spike feature or only the broad pedestal with no spike. Such conditions are not appropriate for atomic frequency standard applications. The cause of the evacuated wall-coated cell lineshape is reviewed and methods to recover the narrow spike feature without restrictions on cell size is discussed. One example is a cell with dimensions having equal volumes of exposure to opposite phases of the microwave magnetic field. Author

N85-29226*# Duke Univ., Durham, N. C. Dept. of Physics.
DIODE LASER 87Rb OPTICAL PUMPING IN AN EVACUATED WALL-COATED CELL c36
Wah-Keat Lee, H. G. Robinson, and C. E. Johnson (North Carolina State Univ.) *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 91-102 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

The evacuated wall coated sealed cell coupled with diode laser optical pumping offers a number of attractive potential advantages for use in Rb or Cs atomic frequency standards. An investigation of systematic effects is required to explore possible limitations of the technique. The use of diode laser optical pumping of 87 Rb in an evacuated wall coated sealed cell is presented. Experimental results/discussion to be presented include the signal strength and line broadening of the 0 - 0 hyperfine resonance as a function of light intensity for the D1 optical transitions (F -> F prime) - (2 -> 1 prime) and (2 -> 2 prime), shift of the 0 - 0 hyperfine frequency as a function of laser intensity and de-tuning from optical resonance, and diode laser frequency stabilization techniques. Author

N85-29227*# Naval Research Lab., Washington, D. C.
ON-ORBIT FREQUENCY STABILITY ANALYSIS OF THE GPS NAVSTAR-1 QUARTZ CLOCK AND THE NAVSTARs-6 AND -8 RUBIDIUM CLOCKS
Thomas B. McCaskill, James A. Buisson, and Wilson G. Reid *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 103-125 refs (For primary document see N85-29221

18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

An on-orbit frequency stability performance analysis of the GPS NAVSTAR-1 quartz clock and the NAVSTARs-6 and -8 rubidium clocks is presented. The clock offsets were obtained from measurements taken at the GPS monitor stations which use high performance cesium standards as a reference. Clock performance is characterized through the use of the Allan variance, which is evaluated for sample times of 15 minutes to two hours, and from one day to 10 days. The quartz and rubidium clocks' offsets were corrected for aging rate before computing the frequency stability. The effect of small errors in aging rate is presented for the NAVSTAR-8 rubidium clock's stability analysis. The analysis includes presentation of time and frequency residuals with respect to linear and quadratic models, which aid in obtaining aging rate values and identifying systematic and random effects. The frequency stability values were further processed with a time domain noise process analysis, which is used to classify random noise process and modulation type. Author

N85-29228*# Rockwell International Corp., Seal Beach, Calif. Satellite System Div.
RUBIDIUM AND CESIUM FREQUENCY STANDARDS STATUS AND PERFORMANCE ON THE GPS PROGRAM
Harry Bethke, Dale Ringer, and M. VanMelle *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 127-141 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

The on-oribt operational performance of the frequency standards on the Global Positioning System (GPS) 1 to 10 NAVSTAR satellites are discussed. The history of the Rb frequency standards showing the improvements incorporated at various stages of the program and the corresponding results are presented. Also presented is the operational history of the NAVSTAR cesium frequency standards. The frequency standards configuration data presented covers the chronology of events from the concept validation satellites, NAVSTAR 1 to 10, starting in 1978 to the present, including the configurations of clocks to be used on the GPS Production Program. Data are presented showing the results of long-term laboratory testing of a production Rb frequency standard with the necessary data taken to calculate Delta F, drift, time error, and Allan variance. R.J.F.

N85-29229*# Litton Guidance and Control Systems, Woodland Hills, Calif.
A MINIATURE TACTICAL Rb FREQUENCY STANDARD
T. M. Kwon, R. Dagle, W. Debley, H. Dellamano, T. Hahn, J. Horste, L. K. Lam, R. Magnuson, and T. McClelland *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 143-155 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

Work on an innovative design for miniature rubidium frequency standards has reached the pre-production demonstration stage at Litton Guidance and Control Systems. Pre-production units were built and tested under contract to the Rome Air Development Center of the U.S. Air Force Systems Command. The units, which are designed for use in tactical military applications, feature fast warm-up, low power consumption, and vibration insensitivity. The output stability under vibration is maintained without the need for external shock-mounts. The design objectives and test results are discussed. R.J.F.

N85-29230*# Army Electronics Technology and Devices Lab., Fort Monmouth, N. J.
THE RUBIDIUM-CRYSTAL OSCILLATOR HYBRID DEVELOPMENT PROGRAM **c33**
John R. Vig and Vincent J. Rosati *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 157-165 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 09A

The rubidium-crystal oscillator hybrid (RbXO) will make precise time available to systems that lack the power required by atomic frequency standards. The RbXO consists of two subassemblies in separate enclosures. One contains a small rubidium frequency standard (RFS) without its internal oven-controlled crystal oscillator (OCXO), plus interface circuits. The second contains a low-power OCXO, and additional interface circuits. The OCXO is on continuously. Periodically, e.g., once a week, the user system applies power to the RFS. After the few necessary for the warmup of the RFS, the interface circuits adjust the frequency of the OCXO to the RFS reference, then shut off the RFS. The OCXO enclosure is separable from the RFS enclosure so that manpacks will be able to operate with minimum size, weight, and power consumption, while having the accuracy of the RFS for the duration of a mission. A prototype RbXO's RFS has operated successfully for 4200 on-off cycles. Parallel efforts on a Phase 2 RbXO development are in progress. Two sources for the RbXO are scheduled to be available during 1986. R.J.F.

N85-29231*# Oscilloquartz S.A., Neuchatel (Switzerland).
NEW FEATURES OF DIFFERENT FREQUENCY GENERATING SYSTEMS DUE TO THE USE OF ELECTRODELESS RIGIDLY MOUNTED VBA QUARTZ CRYSTAL RESONATOR
A. Jendly, E. Graf, G. Busca, and D. A. Brownsea (Plessey Electronic Systems Ltd.) *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 167-190 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

The BVA 5 MHz crystal equipped frequency sources exhibit a new blend of performances such as 10 to 11 daily stability, 5x10-13 short term stability (1 to 30 s time intervals) and close to the carrier low phase noise (1 Hz : -120 dBc, 10 Hz : -140 dBc), whereby retaining the customary crystal oscillator benefits of small volume, high reliability and low price, as opposed to more sophisticated frequency generators which would be required to achieve comparable performances. Examples illustrating the impact of the Oscilloquartz BVA oven-controlled crystal oscillator in different frequency generating systems are presented: cesium frequency standards; hydrogen frequency standard; a precision distribution sub-system for satellite ground stations; and high hierarchy exchanges of digital networks, synchronized by the master-slave method are discussed. R.J.F.

N85-29232*# Beijing Inst. of Radio Metrology and Measurements (China).
THE SYSTEM DESIGN OF A RUBIDIUM MASER FREQUENCY STANDARD **c36**
Cheng-Xi Xiong *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 191-224 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

The Rubidium Maser Frequency Standard is a precision frequency source with excellent short-term stability. A type PBR-II Rb maser frequency standard was developed by the Beijing Institute of Radio Metrology and Measurement (BIRMM). The time-domain frequency stability (two-sample variance) of this frequency standard is less than 1/5 times 10 to the 13th power for t=10ms yields 1.0s, fh=1.0 KHz. Two PBR-II frequency standards were used as reference frequency sources in a frequency stability measurement system. Some important system characteristics for the PBR-II Rb maser frequency standard such as phase noise and frequency stability transfer characteristics are discussed. Furthermore, the design of the frequency standard for optimum frequency stability of the output signal; the choice of a voltage controlled crystal oscillator for the frequency standard; the design of the phase-locked loop; and the frequency stability test results on the PBR-II are discussed. R.J.F.

N85-29233*# Air Force Geophysics Lab., Hanscom AFB, Mass. Ionospheric Physics Div.
A REVIEW OF IONOSPHERIC EFFECTS ON EARTH-SPACE

PROPAGATION Abstract Only c46
John A. Klobuchar *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 225-228 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20N

A short description is given of each ionospheric total electron content (TEC) effect upon radio waves, along with a representative value of the magnitude of each of these effects under normal ionospheric conditions. A discussion is given of the important characteristics of average ionospheric TEC behavior and the temporal and spatial variability of TEC. Radio waves undergo several effects when they pass through the Earth's ionosphere. One of the most important of these effects is a retardation, or group delay, on the modulation or information carried on the radio wave that is due to its encounter with the free, thermal electrons in the Earth's ionosphere. Other effects the ionosphere has on radio waves include: radio frequency (RF) carrier phase advance; Doppler shift of the RF carrier of the radio wave; Faraday rotation of the plane of polarization of linearly polarized waves; angular refraction or bending of the radio wave path as it travels through the ionosphere; and amplitude and phase scintillations. R.J.F.

N85-29234*# Naval Research Lab., Washington, D. C. Ionospheric Effects Branch.
IONOSPHERIC LIMITATIONS TO TIME TRANSFER BY SATELLITE c46
S. H. Knowles *In* NASA. Goddard Sace Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1983 p 229-245 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20N

The ionosphere can contribute appreciable group delay and phase change to radio signals traversing it; this can constitute a fundamental limitation to the accuracy of time and frequency measurements using satellites. Because of the dispersive nature of the ionosphere, the amount of delay is strongly frequency-dependent. Ionospheric compensation is necessary for the most precise time transfer and frequency measurements, with a group delay accuracy better than 10 nanoseconds. A priori modeling is not accurate to better than 25%. The dual-frequency compensation method holds promise, but has not been rigorously experimentally tested. Irregularities in the ionosphere must be included in the compensation process. R.J.F.

N85-29235*# Rome Air Development Center, Hanscom AFB, Mass. Electromagnetic Sciences Div.
A REVIEW OF TROPOSPHERIC REFRACTION EFFECTS ON EARTH-TO-SATELLITE SYSTEMS Abstract Only c46
Edward E. Althsuler *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1983 p 247-248 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20N

Abnormal refractivity gradients may cause radio waves to be trapped within tropospheric layers, thus producing regions through which the waves do not pass called radio holes. For some locations and for many applications, refractive corrections based on the surface refractivity are adequate for elevation angles above a few degrees. However, new systems which operate at elevation angles near the horizon often require improved accuracies. Techniques for obtaining these improved corrections are reviewed. Author

N85-29236*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ATMOSPHERIC LIMITATIONS TO CLOCK SYNCHRONIZATION AT MICROWAVE FREQUENCIES c47
George M. Resch *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 249-259 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 04B

Clock synchronization schemes utilizing microwave signals that pass through the Earth's atmosphere are ultimately limited by our ability to correct for the variable delay imposed by the atmosphere. The atmosphere is non-dispersive at microwave frequencies and imposes a delay of roughly 8 nanosec times the cosecant of the elevation angle. This delay is composed of two parts, the delay due to water vapor molecules (i.e., the wet delay), and the delay due to all other atmospheric constituents (i.e., the dry delay). Water vapor contributes approximately 5 to 10% of the total atmospheric delay but is highly variable, not well mixed, and difficult to estimate from surface air measurements. However, the techniques of passive remote sensing using microwave radiometry can be used to estimate the line of sight delay due to water vapor with potential accuracies of 10 to 20 picosec. The devices that are used are called water vapor radiometers and simply measure the power emitted by the water vapor molecule at the 22.2 GHz spectral line. An additional power measurement is usually included at 31.4 GHz in order to compensate for the effect of liquid water (e.g., clouds). The dry atmosphere is generally in something close to hydrostatic equilibrium and its delay contribution at zenith can be estimated quite well from a simple barometric measurement. At low elevation angles one must compensate for refractive bending and possible variations in the vertical refractivity profile. With care these effects can be estimated with accuracies on the order of 30 picosec down to elevation angles of 10 degree.
Author

N85-29237*# Iowa State Univ. of Science and Technology, Ames. Dept. of Electrical and Computer Engineering.
KALMAN FILTER MODELING c66
R. Grover Brown *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 261-272 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 12B

The formulation of appropriate state-space models for Kalman filtering applications is studied. The so-called model is completely specified by four matrix parameters and the initial conditions of the recursive equations. Once these are determined, the die is cast, and the way in which the measurements are weighted is determined foreverafter. Thus, finding a model that fits the physical situation at hand is all important. Also, it is often the most difficult aspect of designing a Kalman filter. Formulation of discrete state models from the spectral density and ARMA random process descriptions is discussed. Finally, it is pointed out that many common processes encountered in applied work (such as band-limited white noise) simply do not lend themselves very well to Kalman filter modeling. Author

N85-29238*# Stanford Telecommunications, Inc., Santa Clara, Calif.
RELATIONSHIP BETWEEN ALLAN VARIANCES AND KALMAN FILTER PARAMETERS c66
A. J. VanDierendonck, J. B. McGraw, and R. Grover Brown (Iowa State Univ.) *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 273-293 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 12B

A relationship was constructed between the Allan variance parameters (H sub z, H sub 1, H sub 0, H sub -1 and H sub -2) and a Kalman Filter model that would be used to estimate and predict clock phase, frequency and frequency drift. To start with the meaning of those Allan Variance parameters and how they are arrived at for a given frequency source is reviewed. Although a subset of these parameters is arrived at by measuring phase as a function of time rather than as a spectral density, they all represent phase noise spectral density coefficients, though not necessarily that of a rational spectral density. The phase noise spectral density is then transformed into a time domain covariance model which can then be used to derive the Kalman Filter model parameters. Simulation results of that covariance model are presented and compared to clock uncertainties predicted by Allan

variance parameters. A two state Kalman Filter model is then derived and the significance of each state is explained. Author

N85-29239*# Radio Research Labs., Tokyo (Japan).
DEVELOPMENT OF HYDROGEN MASERS FOR K-3 VLBI SYSTEM **c36**
Takao Morikawa, Yasusada Ohta, and Hitoshi Kiuchi *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 295-311 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

Two field operable hydrogen masers were developed for the VLBI joint experiment conducted by the cooperation between RRL and NASA. They are now playing an important role as the time and frequency standard of the K-3 VLBI system, which has also been developed by RRL. Author

N85-29240*# Sigma Tau Standards Corp., Tuscaloosa, Ala.
ATOMIC HYDROGEN MASER ACTIVE OSCILLATOR CAVITY AND BULB DESIGN OPTIMIZATION **c36**
H. E. Peters and P. J. Washburn *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 313-338 refs Sponsored in part by NASA. Goddard Space Flight Center (For primary document see N85-29221 18-35)
(Contracts N00014-83-C-2015; APL/JHU-601748-S)
Avail: NTIS HC A21/MF A01 CSCL 20E

The performance characteristics and reliability of the active oscillator atomic hydrogen maser depend upon oscillation parameters which characterize the interaction region of the maser, the resonant cavity and atom storage bulb assembly. With particular attention to use of the cavity frequency switching servo (1) to reduce cavity pulling, it is important to maintain high oscillation level, high atomic beam flux utilization efficiency, small spin exchange parameter and high cavity quality factor. It is also desirable to have a small and rigid cavity and bulb structure and to minimize the cavity temperature sensitivity. Curves for a novel hydrogen maser cavity configuration which is partially loaded with a quartz dielectric cylinder and show the relationships between cavity length, cavity diameter, bulb size, dielectric thickness, cavity quality factor, filling factor and cavity frequency temperature coefficient are presented. The results are discussed in terms of improvement in maser performance resulting from particular design choices. Author

N85-29241*# Williams Coll., Williamstown, Mass.
HYDROGEN MASER OSCILLATION AT 10 K **c36**
S. B. Crampton, K. M. Jones, and S. P. Souza *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 339-350 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

A low temperature atomic hydrogen maser was developed using frozen atomic neon as the storage surface. The maser has been operated in the pulsed mode at temperatures from 6 K to 11 K and as a self-excited oscillator from 9 K to 10.5 K. Author

N85-29242*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
A LOW NOISE SYNTHESIZER FOR AUTOTUNING AND PERFORMANCE TESTING OF HYDROGEN MASERS **c36**
James M. Cloeren and Jeffrey S. Ingold (Allied Bendix Aerospace, Columbia, Md.) *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 351-356 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

A low noise synthesizer has been developed for use in hydrogen maser autotuning and performance evaluation. This synthesizer replaces the frequency offset maser normally used for this purpose and allows the user to maintain all masers in the ensemble at the same frequency. The synthesizer design utilizes a quartz oscillator with a BVA resonator. The oscillator has a frequency offset of 5 X 10 to the minus 8 power. The BVA oscillator is phase-locked to a hydrogen maser by means of a high gain, high stability phase-locked loop, employing low noise multipliers as phase error amplifiers. A functional block diagram of the synthesizer and performance data will be presented. Author

N85-29243*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ATOMIC HYDROGEN MASER MEASUREMENTS WITH WALL SURFACES OF CARBON TETRAFLUORIDE **c36**
R. F. C. Vessot, E. M. Mattison, E. A. Imbier, and Z. C. Zhai *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 351-374 refs (For primary document see N85-29221 18-35)
(Contract N00014-77-C-0777)
Avail: NTIS HC A21/MF A01 CSCL 20E

The principal objectives of the Smithsonian Astrophysical Observatory cold maser research programs are given. This work is aimed principally at understanding more about the interaction of hydrogen atoms with wall coatings of fluorinated ethylene propylene (Dupont Teflon FEP-120 co-polymer) and of carbon tetrafluoride (CE4). The principal measured quantity in these experiments is the wall shift of the maser's output frequency. The wall shift per atomic collision was calculated from the measured wall frequency shift. This assumes that the wall surface area is smooth on a molecular scale. B.W.

N85-29244*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
PERFORMANCE DATA OF US NAVAL OBSERVATORY VLG-11 HYDROGEN MASERS SINCE SEPTEMBER, 1983 **c36**
R. F. C. Vessot, E. M. Mattison, E. A. Imbier, Z. C. Zhai, William J. Klepczynski, P. G. Wheeler, A. J. Kubik, and G. M. E. Winkler *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 375-384 refs Prepared in cooperation with Naval Observatory, Washington, D.C. (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

In 1983, two VLC-11 masers were delivered to the U.S. Naval Observatory by the Smithsonian Astrophysical Observatory. Last year the short-term stability of these masers was reported and the effect of this short-term stability on timekeeping performance was examined. Since the date of installation, 13 September 1983, data on the masers' long-term performance have been accumulated. The Allan variance, agma(tau), of the relative frequency between the masers reaches a minimum of about 4 parts in 10 to the 16th power at averaging times 5,000 seconds and rises at longer averaging times due, at least partly, to systematic frequency drift. The systematic frequency drifts, expressed in units of fractional frequency difference per day are discussed. B.W.

N85-29245*# Naval Observatory, Washington, D.C. Time Service Dept.
TIME TRANSFER TECHNIQUES: HISTORICAL OVERVIEW, CURRENT PRACTICES AND FUTURE CAPABILITIES
William J. Klepczynski *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 385-402 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

A brief historical review of time transfer techniques used during the last twenty years is presented. Methods currently used are discussed in terms of cost effectiveness as a function of accuracy achievable. Future trends are also discussed in terms of projected timekeeping capabilities. Author

N85-29246*# Frequency and Time Systems, Inc., Beverly, Mass.
MASER AND SECONDARY CLOCK IN TELECOMMUNICATIONS NETWORKS
Allan Risley *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and

Planning Meeting 1984 p 403-410 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

Telecommunication networks of time division switches, interconnected by digital transmission are being put into place. At each switch, each incoming bit stream is brought into its own buffer. Then the clock in the switch reads each buffer to re-establish phase. Care must be taken to keep frequency differences between various clocks from becoming too large. Based on empirically defined data transmission requirements, one major network has determined that fractional frequency inequality between switches should be no worse than 1.7 X 10 to the minus 9 power. A network needs near frequency equality between its own switches, and also between its switches and other networks with which it interfaces. As a practical matter, the best way to achieve needed frequency equality is for each network to have master clock with an accuracy which is at least as good as 1 X 10 to the minus 10 power. The relationship between the master and the secondary clock is discussed. The questions of master clock accuracy and precision and the free-running capability of the secondary clocks are examined. B.W.

N85-29247*# TRAK Microwave Corp., Tampa, Fla.
NEW GOES SATELLITE SYNCHRONIZED TIME CODE GENERATION
D. Earl Fossler and Roger K. Olson *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 411-418 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 22B

The TRAK Systems' GOES Satellite Synchronized Time Code Generator is described. TRAK Systems has developed this timing instrument to supply improved accuracy over most existing GOES receiver clocks. A classical time code generator is integrated with a GOES receiver. B.W.

N85-29248*# Federal Bureau of Measures and Precious Metals, Belgrade (Yugoslavia).
THE TIME AND FREQUENCY COMPARISONS VIA LORAN-C AND NATIONAL TV NETWORK IN YUGOSLAVIA
Zoran M. Markovic and Stijepo Hajdukovic *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 419-426 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

Time comparisons were made between cesium clocks in Yugoslavia and other cesium clocks in the country by the Laboratory of Federal Bureau of Measures and Precious Metals. Regional standard frequency and time signals dissemination is over National TV network by so called active TV system. International comparisons are performed via Loran-C system and by clock transportation. The method of calculation and approximation of the time signal propagation delays is given. Settled comparison results of the cesium clocks via TV network, Loran-C, and by clock transportation are also discussed in this paper. B.W.

N85-29249*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MAINTENANCE OF TIME AND FREQUENCY IN THE JET PROPULSION LABORATORY'S DEEP SPACE NETWORK USING THE GLOBAL POSITIONING SYSTEM
P. A. Clements, S. E. Borutzki, and A. Kirk *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 427-446 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 22B

The Deep Space Network (DSN), managed by the Jet Propulsion Laboratory for NASA, must maintain time and frequency within specified limits in order to accurately track the spacecraft engaged in deep space exploration. Various methods are used to coordinate the clocks among the three tracking complexes. These methods include Loran-C, TV Line 10, Very Long Baseline Interferometry (VLBI), and the Global Positioning System (GPS). Calculations are made to obtain frequency offsets and Allan variances. These data are analyzed and used to monitor the performance of the hydrogen masers that provide the reference frequencies for the DSN Frequency and Timing System (DFT). Areas of discussion are: (1) a brief history of the GPS timing receivers in the DSN, (2) a description of the data and information flow, (3) data on the performance of the DSN master clocks and GPS measurement system, and (4) a description of hydrogen maser frequency steering using these data. Author

N85-29250*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Frequency and Timing System Cognizant Operations.
USING GPS AND VLBI TECHNOLOGY TO MAINTAIN 14 DIGIT SYNCHRONIZATION
Samuel C. Ward *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 447-465 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

To facilitate the navigation of spacecraft to the outer planets, Jupiter and beyond, the JPL-NASA Deep Space Network (DSN) has implemented three ensembles of atomic clocks at widely separated locations. These clocks must be maintained, synchronized, to with a few parts in 10 to the 13th power of each other and, the entire group must be maintained, to a lesser degree, in synchronism with Coordinated Universal Time (UTC)[NBS/USNO]. Over the last 1 1/2 years the DSN has been using Global Positioning Satellites (GPS) and Very Long Baseline Interferometry (VLBI) technology to perform these critical Frequency and Time (F&T) synchronization tasks. A year of F&T synchronization data collected from the intercomparison of 3 sets of cesium and hydrogen maser driven clock ensembles through the use of GPS and VLBI techniques are covered. Also covered, are some of the problems met and limitations of these two techniques at their present level of technology. Author

N85-29251*# National Bureau of Standards, Boulder, Colo. Time and Frequency Div.
A SIMPLIFIED GPS C/A RECIEVER FRONT END WITH LOW NOISE PERFORMANCE
D. D. Davis and A. D. J. Clements *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 467-474 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

A redesign of the antenna electronics package for the NBS/GPS C/A receiver has resulted in significantly reduced cost and improved performance. Major improvements include a simplified and more reliable multiplier/mixer, elimination of all twelve piston trimmer tuning capacitors in the original design, elimination of expensive bandpass filters, less expensive antenna and a simplified packaging scheme. Author

N85-29252*# Trimble Navigation, Mountain View, Calif.
PERFORMANCE TEST RESULTS OF A LOW COST GPS TIME AND FREQUENCY MONITOR Abstract Only
Ron C. Hyatt and Kavad Asjkaee *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 475-476 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 14B

Final prototype and pilot production performance test results was presented on a single channel C/A code GPS receiver that was optimized for time and frequency applications. Timing accuracy and stability test results are presented, as well as position determination results. Timing accuracy, timing stability, frequency stability, position accuracy and position stability are presented in the results. Author

N85-29253# Battelle Columbus Labs., Ohio.
DESIGN ISSUES IN VIDEO DISC MAP DISPLAY Final Report
J. M. Olson Oct. 1984 69 p Supersedes AD-A149646
(Contract DAAG29-81-D-0100)

(AD-A153531; ETL-0362) Avail: NTIS HC A04/MF A01 CSCL 14/3

Video disc map display designs are presented. Topics include: Introduction; Video Disc Technology and Vocabulary; Questions of Design; Further Design Work in Video Disc Mapping; The Future of the Video Disc for Map Display; Annotated Bibliography; Map Video Discs: A Listing; The Relationship between Map Area per Frame and Map Legibility; Observations About Type on Video Discs; and Illustrations. GRA

N85-29254# Argonne National Lab., Ill. Energy and Environmental Systems Div.

TEMPERATURE SENSORS FOR OTEC APPLICATIONS

L. Seren, C. B. Panchal, and D. M. Rote May 1984 58 p refs (Contract W-31-109-eng-38)

(DE85-009807; ANL/CTEC-PS-12) Avail: NTIS HC A04/MF A01

Ocean thermal energy conversion (OTEC) applications require accurate measurement of temperatures in the 0 to 30 C range. Commercially available quartz-crystal thermometers and thermistors were examined. Three fixed-point baths were used for temperature measurements: the distilled-water/distilled-ice-water slurry, the triple-point-of-water cell, and the gallium melting-point cell. The temperature of carefully prepared ice-water slurries was verified routinely as 0.001 + or - 0.003 C. Quartz-crystal probes proved accurate to about 1 to 2 mK, with drift errors of the same order over a few days. Bead and disk-type thermistor probes were found to be about equally stable with time in the 0 to 30 C range. The overall probable error of using thermistors was found to be + or -4 mK. A solid-block temperature bath suitable for on-site calibrations in OTEC work was used in the temperature-sweeping mode. Various polynomial fits were examined for thermistor calibration; fits of order two and higher yielded about equally accurate calculated temperatures. DOE

N85-29255# California Univ., Livermore. Lawrence Livermore Lab.

VISUAL SIMULATION OF RADIOGRAPHS

G. Laguna 18 Jan. 1985 8 p refs

(Contract W-7405-eng-48)

(DE85-010213; UCRL-53613) Avail: NTIS HC A02/MF A01

A method for computer simulation of radiographs has been added to the LLNL version of the solid modelers TIPS-1 (Technical Information Processing System-1). This new tool will enable an engineer to compare an actual radiograph of a solid to its computer-generated counterpart. The appearance of discrepancies between the two can be an indication of flaws in the solid object. Simulated radiographs can also be used to preview the placement of X-ray sources to focus on areas of concern before actual radiographs are made. DOE

N85-29256# Midwest Research Inst., Golden, Colo.

UNITED STATES PARTICIPATION IN INTERNATIONAL ENERGY AGENCY TASK IX, SUBTASK (C): PYRANOMETRY. 1984 PARTICIPATION Summary Report

C. V. Wells Dec. 1984 51 p refs

(Contract DE-AC02-83CH-10093)

(DE85-009615; SERI/PR-215-2526) Avail: NTIS HC A04/MF A01

A brief history of the International Energy Agency Solar Heating and Cooling Program is given, and the United States involvement in the pyranometry subtask prior to 1984 is documented. U.S. involvement in the pyranometry work during 1984 is detailed, including sensitivity tests, temperature response, and a determination of sensitivity of pyranometers during the eclipse of May 30, 1984. DOE

N85-29257# Oak Ridge National Lab., Tenn. Chemical Technology Div.

NEW TECHNOLOGIES TO IMPROVE LABORATORY TESTING

Carl A. Burtis 1985 56 p refs Presented at the 8th Ann. Arnold O. Beckman Conf. in Clinical Chem., San Diego, Calif., 28-30 Jan. 1985

(Contract DE-AC05-84OR-21400)

(DE85-008151; CONF-850166-1) Avail: NTIS HC A04/MF A01

Several core technologies that are having, or will have, an impact on the clinical laboratory are discussed. These include instrument-related technologies such as computer technology, chemometrics, robotics, sensors, and biological technologies such as cell fusion and recombinant DNA. DOE

N85-29258# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

THE EFFECTS OF EXTREME TEMPERATURES ON THERMOCOUPLES

Michael Fryer, Ned Wilder, and Jerald Edson 1985 10 p refs Presented at the 31st ISA Intern. Instr. Symp., San Diego, Calif., 6 May 1985

(Contract DE-AC07-76ID-01570)

(DE85-008650; EGG-M-034-85; CONF-850582-5) Avail: NTIS HC A02/MF A01

A study of type K thermocouple response to extreme temperatures was conducted at the Idaho National Engineering Laboratory. Oven experiments with lengths of thermocouple cable were performed and temperature measurement errors were recorded between 900 and 1270(0)C. Impedance measurements on the thermocouple cables were made between 22 and 1100(0)C and dc to 10 MHz. A computer model of thermocouple behavior was developed. Good agreement with impedance measurements was attained. Methods for validating thermocouple readings using impedance measurements were developed. DOE

N85-29259# Sandia Labs., Albuquerque, N. Mex.

OPTICAL FIBER MAGNETIC FIELD SENSOR WITH NANOSECOND RESPONSE TIME

M. A. Butler and S. J. Martin 1985 3 p refs Presented at the 3rd Intern. Conf. on Solid-State Sensors and Actuators, Philadelphia, 12 Jun. 1985

(Contract DE-AC04-76DP-00789)

(DE85-008409; SAND-84-23630; CONF-850685-1) Avail: NTIS HC A02/MF A01

The attraction of optical fiber technology in the communications industry is the potentially huge bandwidths available. However, this unique characteristic does not appear to have been utilized in the development of new sensors. A new fiber based, magnetic field sensor with a potential bandwidth of several gigahertz is reported. The key element in this sensor is the magnetic semiconductor which uses the Faraday effect to detect the magnetic field. Polarized light passing through this material undergoes a rotation of polarization by an amount proportional to the magnetic field and the optical path length. With a polarizing analyzer this rotation is converted into amplitude modulation of the light. DOE

N85-29260# Naval Research Lab., Washington, D. C. Plasma Physics Div.

PROPOSAL FOR CONTINUATION OF RESEARCH ON MEGAWATT GYROTRONS FOR THE PERIOD JANUARY 1, 1985 THROUGH DECEMBER 31, 1986

M. E. Read, A. W. Fliflet, and W. M. Manheimer 18 Dec. 1984 6 p

(Contract DE-AI05-83ER-52092)

(DE85-009962; DOE/ER-52092/T1) Avail: NTIS HC A02/MF A01

Research was performed on concepts for high power gyrotrons. The work was in support of industrial development of high freuqency (60 to 140 GHz) CW gyrotrons, the research was on the origination, development, and testing of advanced concepts. The research included experimental work on quasioptical and complex cavity gyrotrons and theoretical efforts on these concepts and whispering gallery gyrotrons. DOE

N85-29261# Los Alamos Scientific Lab., N. Mex.

COMPACT L-EDGE DENSITOMETER FOR URANIUM CONCENTRATION ASSAY

M. L. Brooks (New Mexico Inst. of Mining and Technology), P. A. Russo, and J. K. Sprinkle, Jr. Feb. 1985 29 p refs

(Contract W-7405-eng-36)

(DE85-010344; LA-10306-MS) Avail: NTIS HC A03/MF A01

A new L-edge densitometer was designed around a compact, commercial X-ray generator weighing less than 5 kg. The dc generator X-ray spectrum was tailored to produce a continuum of X-ray energies from 14 to 20 keV. The X-rays were transmitted through uranium reference solutions, and the measured transmissions near the uranium L/sub III/-absorption edge were used to compute the uranium concentration assay result. The range of uranium concentrations in the reference solutions included 5 to 50 g/1. In this concentration range, the assay uncertainty for short count times and the flatness of the specific assay response were better than 0.5%. Thus, the precision and accuracy of this compact densitometer are equal to those demonstrated previously for the L-edge technique. The compact dimensional and optimized transmission geometry increase the practicality, versatility, and range of the L-edge applications. DOE

N85-29262# Interuniversitair Reactor Instituut, Delft (Netherlands). Stralingsbeschermingsdienst.
DOSIMEASUREMENTS WITH THERMOLUMINESCENCE DOSIMETERS AT A FEBETRON 701, 600 KV IN ROOM 022 OF THE INTERUNIVERSITY REACTOR INSTITUTE (IRI) [DOSIMETINGEN MET THERMOLUMINESCENTIEDOSIMETERS BIJ HET BEDRIFF VAN EEN FEBETRON 701, 600 KV, IN KAMER 022 VAN HET IRI]
M. H. vanWijngaarden and W. F. Passchier Jan. 1984 7 p In DUTCH
(IRI-190-84-02) Avail: NTIS HC A02/MF A01

Pairs of TLD-200 and TLD-700 dosimeters were used to verify the calculated dose equivalent at 1000 pulses of a Febetron 701 radiation machine. Results show that measured values are below the calculated values. Author (ESA)

N85-29263# National Bureau of Standards, Gaithersburg, Md.
STATE WEIGHTS AND MEASURES LABORATORIES: PROGRAM HANDBOOK Final Report
H. V. Oppermann and J. K. Taylor Feb. 1985 86 p refs
(PB85-183358; NBS/HB-143; LC-85-600502) Avail: NTIS HC A05/MF A01 CSCL 14B

As part of its program to encourage a high degree of technical and professional competence in such activities, the National Bureau of Standards (NBS) has developed performance standards and formalized procedures for the following two purposes: (1) certification of competence for the production of reliable metrological measurements (principally mass, volume, and length), and (2) authorization to conduct initial evaluation of weighing and measuring devices/systems before their use in commerce. The procedures followed by NBS in certifing State weights and measures laboratories for competence are described. The procedures followed in authorizing certified States weights and measures laboratories to conduct evaluation of weighing and measuring devices and systems under the National Type Evaluation Program (NTEP) are also discussed. Author (GRA)

N85-29345# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AN INFORMATION THEORETICAL METHOD FOR AUTOMATIC NOISE ELIMINATION IN DIGITAL IMAGE PROCESSING [EIN INFORMATIONSTHEORETISCHER ANSATZ ZUR AUTOMATISCHEN RAUSCHBESEITIGUNG IN DER DIGITALEN BILDVERARBEITUNG]
Klaus-Juergen Seegel *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 93 1984 p 81-108 refs In GERMAN; ENGLISH summary Original contains color illustrations (For primary document see N85-29343 18-43)
Avail: NTIS HC A06/MF A01

N85-29879*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
SOME DESIGN CONSIDERATIONS FOR A SATELLITE-BORNE MAGNETOGRAPH
David M. Rust *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 141-152 refs (For primary document see N85-29869 18-92)
(Grant NAGw-522)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29880*# Goettingen Univ. (West Germany).
MEASUREMENTS OF VECTOR FIELDS WITH DIODE ARRAY
Eberhard J. Wiehr and W. Scholiers (Inst. d'Astrophysique, Brussels) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 153-159 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29881*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ANALYSIS OF THE NEW POLARIMETER FOR THE MARSHALL SPACE FLIGHT CENTER VECTOR MAGNETOGRAPH
E. A. West *In its* Meas. of Solar Vector Magnetic Fields May 1985 p 160-172 ref (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29882*# Tokyo Astronomical Observatory (Japan).
THE SOLAR VECTOR MAGNETOGRAPH OF THE OKAYAMA ASTROPHYSICAL OBSERVATORY
Mitsugu Makita, Shigeo Hamana, and Keizo Nishi *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 173-182 refs Original contains color illustrations (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29883*# Hawaii Univ., Kula. Inst. for Astronomy.
VECTOR MAGNETIC FIELD OBSERVATIONS WITH THE HALEAKALA POLARIMETER
D. L. Mickey *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 183-191 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29884*# Observatoire de Paris-Meudon (France).
STOKES PARAMETERS MODULATOR FOR BIREFRINGENT FILTERS
Audouin Dollfus *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 192-201 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29885*# California State Univ., Northridge. Dept. of Physics and Astronomy.
THE SAN FERNANDO OBSERVATORY VIDEO STOKES POLARIMETER
Paul H. Richter, Louis K. Zeldin, and Timothy A. Loftin *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 202-218 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29886*# Observatoire de Paris-Meudon (France).
THE NEW SOLAR MAGNETOGRAPH FOR THE CANARY ISLANDS OBSERVATORY THEMIS
J. Rayrole *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 219-230 (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29887*# Academy of Sciences (USSR), Irkutsk. Inst. of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation.
THE VECTOR MAGNETOGRAPH OF THE SAYAN SOLAR OBSERVATORY
V. M. Grigoryev, N. I. Kobanov, B. F. Osak, V. L. Selivanov, and V. E. Stepanov *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 231-256 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

N85-29888*# Academia Sinica, Peking (China).
MULTICHANNEL BIREFRINGENT FILTER
Ai Gouxiang and Hu Huefeng *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 257-259 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

36 LASERS AND MASERS

Includes parametric amplifiers.

N85-29264* National Aeronautics and Space Administration. Pasadena Office, Calif.
DIGITAL CONTROL OF DIODE LASER FOR ATMOSPHERIC SPECTROSCOPY Patent
Robert T. Menzies (JPL, Pasadena, Calif.) and Charles W. Rutledge, inventors (to NASA) (JPL, Pasadena, Calif.) Issued 2 Apr. 1985 10 p Filed 3 Jun. 1982 Sponsored by NASA
(NASA-Case-NPO-16000-1; US-Patent-4,509,130; US-Patent-Appl-SN-384547; US-Patent-Class-364-556; US-Patent-Class-250-339) Avail: US Patent and Trademark Office CSCL 20E

A system is described for remote absorption spectroscopy of trace species using a diode laser tunable over a useful spectral region of 50 to 200 cm(-1) by control of diode laser temperature over range from 15 K to 100 K, and tunable over a smaller region of typically 0.1 to 10 cm(-1) by control of the diode laser current over a range from 0 to 2 amps. Diode laser temperature and current set points are transmitted to the instrument in digital form and stored in memory for retrieval under control of a microprocessor during measurements. The laser diode current is determined by a digital to analog converter through a field effect transistor for a high degree of ambient temperature stability, while the laser diode temperature is determined by set points entered into a digital to analog converter under control of the microprocessor. Temperature of the laser diode is sensed by a sensor diode to provide negative feedback to the temperature control circuit that responds to the temperature control digital to analog converter. Author

N85-29265*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MAGNETICALLY SWITCHED POWER SUPPLY SYSTEMS FOR LASERS Patent Application
Thomas J. Pacala, inventor (to NASA) (JPL, Pasadena, Calif.) Filed 19 Mar. 1985 26 p
(Contract NAS7-100)
(NASA-Case-NPO-16402-1; NAS 1.71:NPO-16402-1; US-Patent-Appl-SN-727931) Avail: NTIS HC A03/MF A01 CSCL 20E

A laser power supply system for exciting high power electric discharge gas lasers is described in which separate pulses are utilized to avalanche ionize the gas within the laser and then produce a sustained discharge to cause the gas to emit light energy. A pulsed voltage source is used to charge a storage device such as a distributed capacitance. A transmission line or other suitable electrical conductor connects the storage device to the laser. A saturable inductor switch is coupled in the transmission line for containing the energy within the storage device until the voltage level across the storage device reaches a predetermined level, which level is less than that required to avalanche ionize the gas. An avalanche ionization pulse-generating circuit is coupled to the laser for generating a high voltage pulse of sufficient amplitude to avalanche ionize the laser gas. Once the laser gas is avalanche ionized, the energy within the storage device is discharged through the saturable inductor switch into the laser to provide the sustained discharge. NASA

N85-29266# Japan Broadcasting Corp., Tokyo. Recording and Mechanical Engineering Research Div.
LASER MACHINING AND SOME APPLICATIONS
Yukichi Miyata, Shinichi Yoshimura, and Hitoshi Masuko Oct. 1984 8 p ref
(NHK-Labs-Note-307; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

In response to the requirements for processing various materials, research was begun on laser machining as a new field of technology. An outline of the experimental laser machining equipment is provided. The results of experiments on drilling minute holes in thin sheets of a variety of materials are presented. Examples of current laser machining applications are also presented. B.W.

N85-29267# Hampton Inst., Va. Dept. of Physics and Engineering Studies.
INTENSE EXCITATION SOURCE FOR HIGH POWER LASER Final Report, 26 Sep. 1983 - 25 Dec. 1984
Kwang S. Han 25 Feb. 1985 33 p refs
(Grant DAAG29-83-G-0107)
(AD-A153424; ARO-20922.3-PH-H) Avail: NTIS HC A03/MF A01 CSCL 20/5

A high power blue-green dye laser has been pumped with an array of multiple-stage hypocycloidal-pinch (HCP) plasmas. The maximum untuned laser power obtained with LD490 dye exceeded 230 kW with a pulse width of 1.0 microseconds (FWHM). The HCP pump source was energized by up to 4.2 kJ energy which was stored in the capacitor bank. The plasms temperature 7,250 K was obtained when the HCP was operated for the optimum laser output, The spectral efficiency of the absorbed radiation was 22% or 83% of the maximum efficiency of the optimum blackbody source. Finally, the enhancement of LD490 dye laser output energy has been attemped with the spectrum conversion of HCP pumping light. The result indicates that the secondary dye BBQ enhanced laser output of LD490 dye by a factor of two.GRA

N85-29268# Rochester Univ., N. Y. Dept. of Chemistry.
LASER-STIMULATED VIBRATIONAL EXCITATION OF AN ADSPECIES STUDIED BY A GENERALIZED MASTER EQUATION: NEUTRAL ATOMIC HYDROGEN ON HYDRATED KCl(001) Interim Technical Report
A. C. Beri and T. F. George Apr. 1985 27 p
(Contract N00014-80-C-0472)
(AD-A153665; AD-E401312; UROCHESTER/DC/85/TR-62) Avail: NTIS HC A03/MF A01 CSCL 20/5

Vibrational energy transfer between an IR laser, a solid surface and an adatom is studied by a generalized master equation which includes memory effects. Numerical problems associated with the temporally delocalized memory kernel are overcome by introducing the isomnesic approximation. Results obtained for time scales ranging from 2 ps to 2 micro s for H(H2O)/KCl(001) show that effective vibrational excitation is possible with low power lasers (1 W/sq cm) in spite of fast phonon relaxation. Detailed time-evolution of the system is seen to differ radically from that predicted by Markovian theories, even for fairly long time scales. GRA

N85-29269# Rochester Univ., N. Y. Dept. of Chemistry.
QUANTUM MODEL OF DEPHASING-ENHANCED LASER DESORPTION: MASTER EQUATION APPROACH Interim Technical Report
Jui-Teng Lin (NRL, Washington, D.C.), Xi-Yi Huang, and Thomas F. George Apr. 1985 24 p refs Submitted for publication
(Contract N00014-80-C-0472; Grant AF-AFOSR-0046-82; NR Proj. 056-749)
(AD-A153769; UROCHESTER/DC/85/TR-61) Avail: NTIS HC A02/MF A01 CSCL 20/5

A new model for laser-induced desorption is proposed based on a master equation for the photon population in a closely-couple subsystem involving the relevant degrees of freedom. The validity of approximations such as the Born and Markovian approximations is discussed in terms of the laser pulse duration and multiple time scales of the adspecies-surface system. The desorption rate is numerically calculated from the photon population and the threshold number of photons absorbed by the adspecies. The effects of anharmonicity, dephasing and laser detuning on the desorption

rate are examined. The mechanism of dephasing and the possible direct and indirect desorption channels are discussed. GRA

N85-29270# Toronto Univ., Downsview (Ontario). Inst. for Aerospace Studies.
THE APPLICATION OF LASER RESONANCE SATURATION TO THE DEVELOPMENT OF EFFICIENT SHORT WAVELENGTH LASERS Final Technical Report, 1 Oct. 1979 - 31 Oct. 1984
R. M. Measures 31 Oct. 1984 84 p refs
(Grant AF-AFOSR-0057-80)
(AD-A153951; AFOSR-85-0376TR) Avail: NTIS HC A05/MF A01 CSCL 20/5

Laser saturation of an atomic resonance transition represents an important new mode of coupling laser energy into a gas or plasma. The basic mechanism in either case is superelastic collisional heating of free electrons. For a gas various seed ionization processes precede this interaction. A computational code for mapping the three dimensional nature of this interaction was developed. This is required because this strong interaction invariably distorts and attenuates the laser pulse as it propagates through the medium being excited. A new experimental facility for studying this interaction was developed and the first spectroscopic measurements of the electron temperature produced in a sodium plasma created through laser resonance saturation was completed. This temperature appears to be somewhat lower than predicted by computer simulation. GRA

N85-29271# Department of the Army, Washington, D. C.
A SIMPLE POWER METER FOR HIGH ENERGY PULSED LASERS Patent Application
C. H. Pyles and W. F. Otto, inventors (to Army) Filed 1 Mar. 1985 14 p
(AD-D011661; US-Patent-Appl-SN-707294) Avail: NTIS HC A02/MF A01 CSCL 20/5

A temperature resistance wire is wound about a frame and exposed to the laser beam which causes the temperature of the wire to increase. The resistance change of the wire is measured so as to give an indication of the energy of the laser. The wire is wound with a plurality of turns in one direction so as to make the device non-dependent upon the polarization orientation of the laser. Author (GRA)

N85-29272# Cornell Univ., Ithaca, N.Y. Lab. of Plasma Studies.
INTENSE ION BEAM DIODE DIAGNOSTICS USING A TUNABLE DYE LASER Final Report, 1 Sep. 1983 - 30 Nov. 1984
David A. Hammer 1985 6 p
(Contract DE-AS08-83DP-40189)
(DE85-008079; DOE/DP-40189/1) Avail: NTIS HC A02/MF A01

The initial phase of the development of an intense ion beam diode diagnostic involving the use of a tunable dye laser are summarized. The goal is to measure the diode electric and magnetic fields using two photon Doppler free spectroscopy. The specifications of the tunable laser required for the experiment were determined, and the laser purchased. Additional necessary optical system and vacuum system components were purchased. The laser system is now operating and experience was gained on it using simple optics and spectroscopy tasks. DOE

N85-29273# Lincoln Land Community Coll., Springfield, Ill.
TECHNIQUE FOR MEASURING SURFACE DIFFUSION BY LASER-BEAM-LOCALIZED SURFACE PHOTOCHEMISTRY
H. J. Zeiger, J. Y. Tsao, and D. J. Ehrlich 1985 26 p refs Presented at the Topical Meeting on Microphys. of Surfaces, Beams and Adsorbates, Santa Fe, N. Mex., 4 Feb. 1985 Sponsored in part by Department of the Air Force, AFOSR, DARPA and ARO
(Contract DE-AC04-76DP-00789)
(DE85-007885; SAND-84-2114C; CONF-850273-1) Avail: NTIS HC A03/MF A01

A technique was developed for determining the surface diffusivity of a weakly bound adsorbate by measuring the kinetics of a spatially localized, laser-beam-driven surface photoreaction. The diffusivity is extracted from the experimental data by means of a general theoretical analysis in which the diffusion equation is solved by a Green's function integral technique. The solution is numerically integrated in order to calculate the spatial and temporal evolution of the surface-number-density of parent and product molecules in a beam localized adsorbate reaction. The new technique was used to determine the surface diffusivity of tetraethyl lead molecules adsorbed on sapphire from data on the deposition of thin films by photolysis of these molecules. The technique may be more broadly applicable to the measurement of the surface diffusion of other weakly bound or fragile polyatomic molecules. DOE

N85-29274# Purdue Univ., Lafayette, Ind. Flame Diagnostics Lab.
MEASUREMENT OF RADICAL SPECIES CONCENTRATIONS AND POLYCYCLIC AROMATIC HYDROCARBONS IN FLAMES BY FLUORESCENCE AND ABSORPTION USING A TUNABLE DYE LASER Progress Report, 1 Mar. 1982 - 28 Feb. 1985
J. Thaddeus Salmon, Diane L. Peterson, Paul A. Nagy, and Normand M. Laurendeau Mar. 1985 26 p refs
(DE85-008624; DOE/ER-04939/7; COO-4939/7) Avail: NTIS HC A03/MF A01

The development of quantitative laser fluorescence methods for measuring the concentrations of radical species and polycyclic aromatic hydrocarbons (PAH's) in flames was studied. Quantitative laser-saturated fluorescence (LSF) measurements of OH concentration in hydrogen/oxygen/argon flames over wide ranges of flame pressure and stoichiometry were demonstrated. The following measures were undertaken: (1) extent the OH analysis to atmospheric pressure methane-air flames under both clean and sooting conditions; (2) conducted LSF measurements of NH in a subatmospheric methane-nitrous oxide flame; (3) improved the calibration procedure used to obtain number densities from the fluorescence measurements; (4) investigated the effects of nonuniform laser illumination on LSF measurements; (5) detected hydrogen atom fluorescence in a flame using laser-induced two-photon absorption; (6) developed a technique for measuring the concentrations of PAH's in vapor state mixtures; and (7) initiated the application of LSF to measurements of CN. DOE

N85-29275# Spectra Technology, Inc., Bellevue, Wash.
DEFINITION OF REQUIREMENTS FOR INJECTION LOCKING OF PULSED UV LASERS Final Report
11 Apr. 1985 27 p refs
(Contract DE-AC04-79AL-10732)
(DE85-010126; DOE/AL-10732/T1) Avail: NTIS HC A03/MF A01

The purpose of this program was a demonstration that successful beam quality control of laser isotope separation (LIS)-scale rare gas halide (RgH) lasers could be achieved with relatively low power injection sources. This is particularly important when one considers that high repetition rates are required in the LIS system. Commercially available Exci-Lite are compact and quite inexpensive. If it could be shown that lasers of this type are suitable as injection sources for much higher power LIS lasers, then injection locking could be incorporated into the LIS system with minimal impact. A demonstration program was divided into two parts. The first was a demonstration of the energy scaling which could be achieved in injection locking. An Exci-Lite scale RgH laser was used to inject a single pulse XeCl laser which was similar in dimensions and single pulse energy to proposed LIS devices. DOE

N85-29276# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
OPERATION OF A QUASIOPTICAL ELECTRON CYCLOTRON MASER
E. C. Morse and R. V. Pyle Dec. 1984 8 p refs Presented at the 31st Natl. Vacuum Symp., Reno, Nev., 4-7 Dec. 1984; sponsored by the American Vacuum Society
(Contract DE-AC03-76SF-00098)
(DE85-008450; LBL-18490; CONF-841218-26) Avail: NTIS HC A02/MF A01

The electron cyclotron maser or gyrotron concept was devel-

oped to produce sources producing 200 kW at 28 GHz continuously, and higher power outputs and frequencies in pulsed mode. These sources were useful in electron cyclotron resonance heating in magnetically confined fusion devices. Conventional gyrotrons follow a trend of decreasing power for increasing frequency. In order to circumvent this problem, the quasioptical electron cyclotron maser was proposed. In this device, the closed resonator of the conventional gyrotron is replaced with an open, Fabry-Perot type resonator. The cavity modes are then the TEM-type modes of an optical laser. The RF output, if obtained by diffraction coupling around one of the mirrors, could be in a TEM mode, which would allow for quasioptical transmission of the microwaves into the plasma in fusion devices. DOE

N85-29277# California Univ., Livermore. Lawrence Livermore Lab. Physics Dept.
REVIEW OF SHORT WAVELENGTH LASERS
Peter L. Hagelstein 18 Mar. 1985 34 p refs Presented at the 9th Intern. Conf. on Atomic Phys., Seattle, 23 Jul. 1984
(Contract W-7405-eng-48)
(DE85-009858; UCRL-92336; CONF-840786-5) Avail: NTIS HC A03/MF A01

There has recently been a substantial amount of research devoted to the development of short wavelength amplifiers and lasers. A number of experimental results have been published wherein the observation of significant gain has been claimed on transitions in the EUV and soft X-ray regimes. The present review is intended to discuss the main approaches to the creation of population inversions and laser media in the short wavelength regime. The approaches to pumping EUV and soft X-ray lasers are discussed according to inversion mechanism. The approaches may be divided into roughly seven categories, including collisional excitation pumping, recombination pumping, direct photoionization and photoexcitation pumping, metastable state storage plus optical pumping, charge exchange pumping, and finally, the extension of free electron laser techniques into the EUV and soft X-ray regimes. DOE

N85-29278# Los Alamos Scientific Lab., N. Mex.
THE FREE ELECTRON LASER VARIABLE BRIDGE COUPLER
George Spalek, James H. Billen, Joseph A. Garcia, Donald E. McMurray, Lash D. Harnsborough, Paul M. Giles, and Sally B. Stevens 1985 4 p refs Presented at the Particle Accelerator Conf., Vancouver, British Columbia, 13-6 May 1985
(Contract W-7405-eng-36)
(DE85-009630; LA-UR-85-1021; CONF-850504-2) Avail: NTIS HC A02/MF A01

The Los Alamos free-electron laser (FEL) is being modified to test a scheme for recovering most of the power in the residual 20-MeV electron beam by decelerating the microbunches in a linear standing-wave accelerator and using the recovered energy to accelerate new beam. A variable-coupler low-power model that resonantly couples the accelerator and decelerator structures has been built and tested. By mixing the TE101 and TE102 modes, this device permits continuous variation of the decelerator fields relative to the accelerator fields through a range of 1:1 to 1:2.5. Phase differences between the two structures are kept below 1(0) and are independent of powar-flow direction. The RF power is also fed to the two structures through this coupling device. Measurements were also made on a three-post-loaded variable coupler that is a promising candidate for the same task. DOE

N85-29279# University of Southern California, Los Angeles. Center for Laser Studies.
LIMITING PROCESSES LASER CVD Final Report, Jun. 1983 - Jun. 1984
S. D. Allen, S. M. Copley, and R. H. Edwards 1984 43 p refs
(Contract DE-AT03-83ER-45012)
(DE85-008846; DOE/ER-45012/T1) Avail: NTIS HC A03/MF A01

Preliminary experimental and theoretical research was conducted with the ultimate objective of developing an understanding of the laser chemical vapor deposition (LCVD) process sufficient to predict deposition rates, microstructure, and resulting film properties. SiC deposited on quartz by thermal decomposition of dichloromethylsilane was chosen as the model system. Film thickness profiles, composition, microstructures and film adherence were analyzed. Theoretical support including a preliminary analysis of convective and diffusive transport processes and a finite difference numerical analysis of the laser-generated surface temperature in the substrate were initiated. DOE

N85-29280# Rome Univ. (Italy). Dipt. di Fisica.
SPATIAL CORRELATIONS IN THE DECAY FROM AN UNSTABLE STATE IN THE MALTHUS VERHULST MODEL
V. Bouche 16 Oct. 1984 23 p refs
(NOTA-INTERNA-832) Avail: NTIS HC A02/MF A01

The transient behavior during the decay of an initial unstable state of a reaction diffusion model describing the inhomogeneous fluctuations in the Malthus Verhulst problem applicable to the slowly varying part of the electrical field in a laser cavity was studied. The analysis is performed in a region of the control parameters space where a systematic approximation scheme can be introduced. The enhancement of fluctuations during the transient leads to the growth of the correlation length above its steady state value. Author (ESA)

N85-29281# Rome Univ. (Italy). Dipt. di Fisica.
HAMILTONIAN PICTURE OF THE FREE ELECTRON LASER AND UNITARY SYMMETRIES
G. Dattoli (European Nuclear Energy Agency, Frascati, Italy) and R. Mignani 30 Jan. 1985 17 p refs
(PREPRINT-436) Avail: NTIS HC A02/MF A01

It is shown that the invariance of the free electron laser (FEL) quantum Hamiltonian in a multimode picture can be used to describe the FEL dynamics in terms of an (nsq-l)-dimensional vector F, built up by SU(n) generators. The equation of motion for F amounts to a rotation in SU(n) space plus a dephasing term (due to the noncommutativity of the electron variables). The result that coherence is not preserved under quantum FEL operation is recovered without explicit solutions. Coherence is regained in the classical and in the semiclassical limit. The constants of motion (apart from the total momentum conservation) are given by the Casimir operators of U(n). Author (ESA)

N85-29097# Joint Publications Research Service, Arlington, Va.
RESULTS OF ITALIAN RESEARCH IN HIGH POWER LASERS
Gian Franco Cirri *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 5-10 Transl. into ENGLISH from Ata-Ingr. Automotoristica (Turin), May 1984 p 324-329 Presented at Meeting on Lasers, Milan, 26-27 May 1983 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

N85-29101# Joint Publications Research Service, Arlington, Va.
EUROPE'S PRIMARY PRODUCERS OF INDUSTRIAL LASERS SURVEYED
Hanns Benninghoff *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 29-33 Transl. into ENGLISH from Tech. Runschau (Bern), 31 Jul. 1984 p 17-19 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

N85-29106# Joint Publications Research Service, Arlington, Va.
PHILIPS RESEARCHES GALLIUM ARSENIDE USE FOR LASERS Abstract Only
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-035) 29 Oct. 1984 p 27-28 Transl. into ENGLISH from Tech. Rundschau (Bern), 21 Aug. 1984 p 7 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

N85-29226*# Duke Univ., Durham, N. C. Dept. of Physics.
DIODE LASER 87Rb OPTICAL PUMPING IN AN EVACUATED WALL-COATED CELL
Wah-Keat Lee, H. G. Robinson, and C. E. Johnson (North Carolina State Univ.) *In* NASA. Goddard Space Flight Center Proc. of

the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 91-102 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

N85-29232*# Beijing Inst. of Radio Metrology and Measurements (China).
THE SYSTEM DESIGN OF A RUBIDIUM MASER FREQUENCY STANDARD
Cheng-Xi Xiong *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 191-224 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

N85-29239*# Radio Research Labs., Tokyo (Japan).
DEVELOPMENT OF HYDROGEN MASERS FOR K-3 VLBI SYSTEM
Takao Morikawa, Yasusada Ohta, and Hitoshi Kiuchi *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 295-311 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

N85-29240*# Sigma Tau Standards Corp., Tuscaloosa, Ala.
ATOMIC HYDROGEN MASER ACTIVE OSCILLATOR CAVITY AND BULB DESIGN OPTIMIZATION
H. E. Peters and P. J. Washburn *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 313-338 refs Sponsored in part by NASA. Goddard Space Flight Center (For primary document see N85-29221 18-35)
(Contracts N00014-83-C-2015; APL/JHU-601748-S)
Avail: NTIS HC A21/MF A01 CSCL 20E

N85-29241*# Williams Coll., Williamstown, Mass.
HYDROGEN MASER OSCILLATION AT 10 K
S. B. Crampton, K. M. Jones, and S. P. Souza *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 339-350 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

N85-29242*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
A LOW NOISE SYNTHESIZER FOR AUTOTUNING AND PERFORMANCE TESTING OF HYDROGEN MASERS
James M. Cloeren and Jeffrey S. Ingold (Allied Bendix Aerospace, Columbia, Md.) *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 351-356 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

N85-29243*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
ATOMIC HYDROGEN MASER MEASUREMENTS WITH WALL SURFACES OF CARBON TETRAFLUORIDE
R. F. C. Vessot, E. M. Mattison, E. A. Imbier, and Z. C. Zhai *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 351-374 refs (For primary document see N85-29221 18-35)
(Contract N00014-77-C-0777)
Avail: NTIS HC A21/MF A01 CSCL 20E

N85-29244*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
PERFORMANCE DATA OF US NAVAL OBSERVATORY VLG-11 HYDROGEN MASERS SINCE SEPTEMBER, 1983
R. F. C. Vessot, E. M. Mattison, E. A. Imbier, Z. C. Zhai, William J. Klepczynski, P. G. Wheeler, A. J. Kubik, and G. M. E. Winkler *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 375-384 refs Prepared in cooperation with Naval Observatory, Washington, D.C. (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N85-29282* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD FOR DRIVING TWO-PHASE TURBINES WITH ENHANCED EFFICIENCY Patent
David G. Elliott, inventor (to NASA) (JPL, Pasadena, Calif.) Issued 30 Apr. 1985 6 p Filed 30 Sep. 1982 Continuation of abandoned US Patent Appl-SN-161257, filed 20 Jun. 1980 Sponsored by NASA
(NASA-Case-NPO-15037-2; US-Patent-4,514,137;
US-Patent-Appl-SN-431420; US-Patent-Appl-SN-161257;
US-Patent-Class-415-1; US-Patent-Class-415-68) Avail: US Patent and Trademark Office CSCL 21E

A method for driving a two phase turbine characterized by an output shaft having at least one stage including a bladed rotor connected in driving relation with the shaft is described. A two phase fluid is introduced into one stage at a known flow velocity and caused to pass through the rotor for imparing angular velocity thereto. The angular velocity of the rotor is maintained at a value such that the angular velocity of the tips of the blades of the rotor is a velocity equal to at least 50% of the velocity of the flow of the two phase fluid.
Official Gazette of the U.S. Patent and Trademark Office

N85-29283* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPRAY APPLICATOR FOR SPRAYING COATINGS AND OTHER FLUIDS IN SPACE Patent
Jerome F. Kuminecz and Merlyn F. Lausten, inventors (to NASA) Issued 28 May 1985 7 p Filed 25 Jun. 1982
(NASA-Case-MSC-18852-1; US-Patent-4,519,545;
US-Patent-Appl-SN-392094; US-Patent-Class-239-288;
US-Patent-Class-239-322; US-Patent-Class-239-327;
US-Patent-Class-239-375; US-Patent-Class-239-590;
US-Patent-Class-239-DIG.23; US-Patent-Class-55-DIG.42) Avail: US Patent and Trademark Office CSCL 13I

A self contained spray application is developed for one handed operation in a zero gravity vacuum environment by a free flying astronaut not attached to any spacecraft. This spray applicator eliminates contamination of the operator by back spray. This applicator includes a rigid accumulator containment of a fluid within a flexible bladder the fluid being urged out of the accumulator under pressure through a spray gun. The spray gun includes a spring loaded lockable trigger which controls a valve. When in an open position, the fluid passes through the valve into the ambient environment in the form of a spray. A spray shield is provided which directs the flow of the spray from the applicator by trapping errant particles of spray yet allowing the passage of escaping gases through its material.
Official Gazette of the U.S. Patent and Trademark Office

N85-29284* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LINEAR MOTION VALVE Patent
Joseph A. Chandler, inventor (to NASA) Issued 18 Jun. 1985 5 p Filed 31 Jul. 1984
(NASA-Case-MSC-20148-1; US-Patent-4,523,741;
US-Patent-Appl-SN-636465; US-Patent-Class-251-325;
US-Patent-Class-251-349; US-Patent-Class-251-353;
US-Patent-Class-277-80; US-Patent-Class-277-135) Avail: US Patent and Trademark Office CSCL 13K

The linear motion valve is described. The valve spool em-

ploys magnetically permeable rings, spaced apart axially, which engage a sealing assembly having magnetically permeable pole pieces in magnetic relationship with a magnet. The gap between the ring and the pole pieces is sealed with a ferrofluid. Depletion of the ferrofluid is minimized.

Official Gazette of the U.S. Patent and Trademark Office

N85-29285* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DAZE FASTENERS Patent

L. Robert Jackson, Randall C. Davis, and Allan H. Taylor, inventors (to NASA) Issued 23 Apr. 1985 9 p Filed 17 May 1983

(NASA-Case-LAR-13009-1; US-Patent-4,512,699; US-Patent-Appl-SN-495380; US-Patent-Class-411-368; US-Patent-Class-403-28; US-Patent-Class-403-408; US-Patent-Class-411-378; US-Patent-Class-411-426; US-Patent-Class-411-501; US-Patent-Class-411-531) Avail: US Patent and Trademark Office CSCL 13E

A daze fastener system for connecting two or more structural elements wherein the structural elements and fastener parts have substantially different coefficient of thermal expansion physical property characteristics is employed in this invention. By providing frusto-conical abutting surfaces between the structural elements and fastener parts any differences in thermal expansion/contraction between the parts is translated to sliding motion and avoids deleterious thermal stresses in the connection. An essential feature for isotropic homogeneous material connections is that at least two sets of mating surfaces are required wherein each set of mating surfaces have line element extensions that pass through a common point. Author

N85-29286* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PRECISION MANIPULATOR HEATING AND COOLING APPARATUS FOR USE IN UHV SYSTEMS WITH SAMPLE TRANSFER CAPABILITY Patent

Ronald A. Outlaw and Bill T. Baugh, inventors (to NASA) Issued 14 May 1985 6 p Filed 31 Oct. 1983 Sponsored by NASA

(NASA-Case-LAR-13040-1; US-Patent-4,516,435; US-Patent-Appl-SN-547176; US-Patent-Class-73-863.11; US-Patent-Class-73-864.81; US-Patent-Class-219-201; US-Patent-Class-219-221; US-Patent-Class-219-285; US-Patent-Class-414-217) Avail: US Patent and Trademark Office CSCL 13I

An improvement of a precision manipulator for use in ultra-high vacuum (UHV) system with sample transfer capability in which a spring loaded thermocouple and a heater electrode are both in direct contact with the transferred sample is discussed. The thermocouple and heater electrode assembly are mounted concentric with a sample receiving block on the end of an offset manipulator. Hence, when a sample is transferred from an introduction chamber into the UHV chamber, it contacts the spring loaded thermocouple and then seats a heater electrode. Cooling by a copper plate and a strap combined with the resistance heating capability allow sample temperatures over the range of 150 to 1750 K while positioned in front of any diagnostic instrument in the UHV system and while taking data with these instruments.

Official Gazette of the U.S. Patent and Trademark Office

N85-29287*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FULLY REDUNDANT MECHANICAL RELEASE ACTUATOR Patent Application

Melvin H. Lucy, inventor (to NASA) Filed 2 May 1985 16 p

(NASA-Case-LAR-13198-1; NAS 1.71:LAR-13198-1; US-Patent-Appl-SN-729704) Avail: NTIS HC A02/MF A01 CSCL 13E

A system is described for performing a mechanical release function exhibiting low shock. This system includes two pyrotechnic detents fixed mounted in opposing axial alignment within a cylindrical housing having two mechanical bellows. Two mechanical bellow assemblies, each having one end hermetically bonded to the housing and the other to the respective actuator pin extending from either end of the housing, ensure that all outgassing and contamination from the operation of the pyrotechnic devices will be contained within the housing and bellows. The pin on one end of the assembly is fixed mounted and supported, via a bolt or ball and socket joint so that when the charge corresponding to that pin ignites, the entire assembly will exhibit rectilinear movement, including the opposing pin providing the unlatching motion. NASA

N85-29288*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

REMOTELY OPERABLE PERISTALTIC PUMP Patent Application

Robert R. Belew, inventor (to NASA) Filed 7 Mar. 1985 16 p

(NASA-Case-MFS-28059-1; NAS 1.71:MFS-28059-1; US-Patent-Appl-SN-709255) Avail: NTIS HC A02/MF A01 CSCL 13K

A peristaltic pump is disclosed which includes a roller assembly on which is mounted a series of pump rollers. As the roller assembly is rotated by a drive gear the pump rollers are driven in reverse rotation by means of a stationary ring gear and pump roller gears. An upper pressure shoe plate and a lower pressure shoe plate are positioned above sets of flexible tubing. The tubing is sandwiched between the pressure shoe plates and the pump rollers. A highly compact pump is provided having twice as many fluid channel lines as is conventional. The peristaltic pump device may be remotely operated by means of a rotary actuator which rotates a driving hub, to move the shoe plates by means of eccentric mounted links. The pressure shoe plates may be moved by the rotary actuator to a loaded position in which the fluid lines are pinched by the pump rollers and fluid is pumped to an unloaded position in which the fluid lines are maintained in an undeformed, uncrimped configuration so that no creases or crimps are set into the fluid lines during periods of prolonged non-use. NASA

N85-29289*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ALIGNMENT AND ASSEMBLY TOOL FOR VERY LARGE DIAMETER CYLINDERS Patent Application

James H. Ehl, inventor (to NASA) Filed 31 May 1985 18 p

(NASA-Case-MFS-28001-1; NAS 1.71:MFS-28001-1; US-Patent-Appl-SN-739788) Avail: NTIS HC A02/MF A01 CSCL 13I

A tool used to accurately align and hold very large diameter cylinders together for weld assembly is described. The tool has a U-shaped main body with a horizontal top section and two legs, which are attached to the end of top section and extend outward and downward. Horizontal bottom sections extend outward from the bottoms of legs. The tool has one inner jackscrew and one outer jackscrew on each side of its center, extending downward from top section. Each of the two bottom sections has an attached side clamp for clamping the alignment tool to two opposing skin stringers of cylinders. The jackscrews are adjusted to bring the edges of the ring into precise alignment with the ends of the two large cylinders and so that both joints may be welded around their full circumference. NASA

N85-29290*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

NON-BACKDRIVEABLE FREE WHEELING COUPLING Patent Application

William R. Llewellin, inventor (to NASA) (Martin Marietta Aerospace, Bethesda, Md.) Filed 22 Apr. 1985 11 p Sponsored by NASA

(NASA-Case-MSC-20475-1; NAS 1.71:MSC-20475-1; US-Patent-Appl-SN-725689) Avail: NTIS HC A02/MF A01 CSCL 13I

A rotary coupling for connecting a driven part to a source of rotary force is described. This device transmits rotary force in one direction only and disengages to permit the driven part to free wheel when the input member is stopped and precludes the backdriving of rotary force from output member to input member. The coupling includes an input member having a splined shaft, a coupling member connected to the splined shaft, and a co-axial output member. The coupling member and the output member

having complementary sets of axially facing clutch teeth. Guides in the form of helical grooves on the coupling member and spring loaded followers acting with the guides affect them engagement and disengagement of the clutch teeth by moving the coupling member toward and away from output member, the followers and guides themselves disengaging to permit free wheeling of output member when input member is stopped. NASA

N85-29291*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
IMPROVEMENTS IN TANK TREAD ASSEMBLIES Patent Application
Earl R. Collins, Jr., inventor (to NASA) Filed 18 Jan. 1985 14 p (NASA-Case-NPO-16321-1; NASA-Case-NPO-16322-1; NAS 1.71:NPO-16321-1; NAS 1.71:NPO-16322-1; US-Patent-Appl-SN-692802) Avail: NTIS HC A02/MF A01 CSCL 13F

The proposed tank tread assembly has adjacent tank tread segments joined by a link bearing tapered pins retained by clips inserted through the tread shells perpendicular to the axes of the pins. It also has highway pads attached by a release rod bearing tapered, grooved cams which interlockingly engage tabs inserted into the tread shells. NASA

N85-29292*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VIBRATION CONTROL OF ROTOR SHAFT
Kenzou Nonami 1985 19 p refs Proposed for presentation at Design Eng. Tech. Conf., Cincinnati, 10-13 Sep. 1985; sponsored by ASME
(NASA-TM-87053; E-2616; NAS 1.15:87053) Avail: NTIS HC A02/MF A01 CSCL 13I

Suppression of flexural forced vibration or the self-excited vibration of a rotating shaft system not by passive elements but by active elements is described. The distinctive feature of this method is not to dissipate the vibration energy but to provide the force cancelling the vibration displacement and the vibration velocity through the bearing housing in rotation. Therefore the bearings of this kind are appropriately named Active Control Bearings. A simple rotor system having one disk at the center of the span on flexible supports is investigated in this paper. The actuators of the electrodynamic transducer are inserted in the sections of the bearing housing. First, applying the optimal regulator of optimal control theory, the flexural vibration control of the rotating shaft and the vibration control of support systems are performed by the optimal state feedback system using these actuators. Next, the quasi-modal control based on a modal analysis is applied to this rotor system. This quasi-modal control system is constructed by means of optimal velocity feedback loops. The differences between optimal control and quasi-modal control are discussed and their merits and demerits are made clear. Finally, the experiments are described concerning only the optimal regulator method. Author

N85-29293*# National Aeronautics and Space Administration, Washington, D. C.
STUDY OF MESHING OF BEVELED GEARS WITH NORMALLY DECREASING ARC TEETH
F. L. Litvin and Go Kay Jun. 1985 28 p refs Transl. into ENGLISH from Teor. Mashin i Mekhan. (Moscow), no. 92-93, 1962 p 28-47 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NAS2-4005)
(NASA-TM-77866; NAS 1.15:77866) Avail: NTIS HC A03/MF A01 CSCL 13I

The meshing of beveled gears was studied by the direct and inverse approaches. Gear wheels with teeth of equal height are studied, and wheels with normally-decreasing arc teeth. Different coordinate systems are utilized to plot the determination of the rotation of the originating gear wheel and the meshing line of the gear wheel which is cut. Matrices are used to determine the equations of the originating surfaces and the unit vectors of the normals to these originating surfaces. E.A.K.

N85-29294*# National Aeronautics and Space Administration, Washington, D. C.
IMPROVEMENT OF CONDITIONS FOR MESHING SPIRAL BEVEL GEARS
F. I. Litvin and Go Kay Jun. 1985 24 p refs Transl. into ENGLISH from Teor. Mashin i Mekhan. (Moscow), no. 98-99, 1964 p 87-103 Transl. by The Corporate Word, Pittsburgh, Pa
(Contract NASw-4006)
(NASA-TM-77867; NAS 1.15:77867) Avail: NTIS HC A02/MF A01 CSCL 13I

The effect of axial pinion displacement on gear meshing conditions during cutting and correction of the rolling chain gear ratio are analyzed. The so-called inverse problem-solving method is used. Author

N85-29295*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POWDER METALLURGY FORGED GEAR DEVELOPMENT Final Report, Sep. 1980 - Jul. 1984
D. H. Ro, B. L. Ferguson, S. Pillay, Donald T. Ostberg, and Dennis Townsend Mar. 1985 112 p refs
(Contract DAAE07-80-C-9115)
(NASA-TM-87483; NAS 1.15:87483; AD-A153479; TACOM-TR-13046) Avail: NTIS HC A06/MF A01 CSCL 13/9

The purpose of this project is to investigate and develop powder forging methods for producing high-perfomance gears from sintered performs. Three gears have been forged from grade 4600 steel powder to which sufficient graphite was added to achieve the desired final carbon level. The first gear, referred to as the NASA test gear because it was designed specifically for gear testing at NASA Lewis Research Center, was forged from 4620 and 4640 steel powder preforms. This gear was a straight spur gear with 28 involute teeth, a 0.25 inch-(6.35 mm) thick web, and a top and bottom hub. Both net teeth and oversize teeth (0.004 inches grinding stock per side) were forged, with these gears being carburized after forging. Gears were then tested in a four square gear testing rig at NASA under the guidance of Dennis Townsend. Using a maximum Hertzian stress of 248,000 psi at pitch line and a gear rotational speed of 10,000 rpm, gear lives were obtained for these gears. GRA

N85-29296# Virginia Univ., Charlottesville. Dept. of Materials Science.
STUDIES ON SURFACE PROCESSES DURING FRICTION AND WEAR
Doris Kuhlmann-Wilsdorf Mar. 1985 76 p refs
(Contract N00014-83-K-0245)
(AD-A153509) Avail: NTIS HC A05/MF A01 CSCL 20/11

In the previous contract period, experimental as well as theoretical research has been carried out. The former has concentrated on the development of a novel testing apparatus which promises to reveal hitherto inaccessible details on the surface condition of materials during sliding. It employs simultaneous measurements of the coefficient of friction and the electrical contact resistance, using a soft set-up and following the momentary variations. This research has not yet yielded reportable results but progress is most encouraging. Theoretical work has been devoted to theory of plastic deformation. Of by far the greater interest in connection with the present contract theme, namely friction and wear and surface processes governing these, has been the research embodied in the two extensive papers which are appended herewith. As is seen from these, it has been possible to derive rather simple analytical, closed equations for the evaluation of the momentary temperature at contact spots during sliding. This theory has been extended to the case of concurrent friction and Joule heating, as presented in this paper, which has been submitted to the WEAR OF MATERIALS 1985 conference. This document concentrates on de-mystifying flash temperatures. GRA

N85-29297# Army Belvoir Research and Development Center, Fort Belvoir, Va.
DEVELOPMENT OF A HIGH-TEMPERATURE COOLANT FOR

ADVANCED DIESEL ENGINES Final Report
I. S. Rhee Nov. 1984 55 p
(AD-A153680; BRDC-2415) Avail: NTIS HC A04/MF A01 CSCL 13/1

This study sought to develop a high-temperature coolant for future advanced military diesel engines capable of operating at high temperatures (up to 150 C). The desirable coolant for high-temperature application must have a high boiling point, a low freezing point, good thermal properties (specific heat and thermal conductivity) and must be able to protect the various metals of the cooling system and the engine components against corrosion. In order to evaluate the candidate for high-temperature application under laboratory conditions, the simulated service corrosion test, ASTM D-2570 was conducted at 121 C for 1064 h. Also with this corrosion test mock-up, the cavitation-corrosion test was performed using an aluminum water pump at 121 C for 700 h. The antifreezes used in these tests were mixtures of MIL-A-46153 antifreeze and water containing 50, 60, and 80 wt percent ethylene glycol and similar mixtures containing the antifreeze extender additive, MIL-A-53009. Based on simulated service test results, the antifreeze mixtures containing 50, 60, and 80 wt percent ethylene glycol with antifreeze extender additive were found to be acceptable as potential candidates for the future advanced diesel engine operating at 121 C. Among the three candidate coolants, the antifreeze mixture containing 60 wt percent of MIL-A-46153 with antifreeze extender additive proved to be the optimum coolant for high-temperature application (121 C) based on its boiling point, freezing point, and thermal properties and on the results of the simulated service corrosion and cavitation-corrosion tests. GRA

N85-29298# Los Alamos Scientific Lab., N. Mex.
KIVA: A COMPREHENSIVE MODEL FOR 2D AND 3D ENGINE SIMULATIONS
A. A. Amsden, T. D. Butler, P. J. ORourke, and J. D. Ramshaw 1985 16 p refs Presented at the SAE Intern. Congr. and Exhibition, Detroit, 27 Feb. - 2 Mar. 1985
(Contract W-7405-eng-36)
(DE85-005562; LA-UR-84-4035; CONF-850254-1) Avail: NTIS HC A02/MF A01

A comprehensive numerical model that represents the spray dynamics, fluid flow, species transport, mixing, chemical reactions, and accompanying heat release that occur inside the cylinder of an internal combustion engine is discussed. The model is embodied in the KIVA computer code. The code calculates both two-dimensional (2D) and three-dimensional (3D) situations. It is an outgrowth of the earlier 2D CONCHAS-SPRAY computer program. Sample numerical calculations are presented to indicate the level of detail that is available from these simulations. These calculations are for a direct injection stratified charge engine with swirl. Both a 2D and a 3D example are shown. DOE

N85-29299# SKF Technology Services, King of Prussia, Pa.
MECHANICAL INTERACTIONS OF ROUGH SURFACES Project Status Report
1984 9 p
(Contract DE-AC02-84ER-13163)
(DE85-005653; DOE/ER-13163/T1) Avail: NTIS HC A02/MF A01

This project addresses a number of unresolved issues which impact the design of mechanical systems in which surface microtopography per se or events which occur on the microgeometric scale play a critical role. The project is an experimental/analytical investigation to: (1) explore the behavior of lubricated contacts involving microscopically rough surfaces under conditions of combined rolling, sliding and spinning with and without the presence of contaminating particles; and (2) develop processing principles and techniques for the analysis of digitized rough surface profiles to yield surface descriptors that are predictive of functional performance and which have acceptable systematic and random error. DOE

N85-29300# Sandia Labs., Albuquerque, N. Mex. Wind Energy Research Div.
STRUCTURAL DESIGN OF THE SANDIA 34-METER VERTICAL-AXIS WIND TURBINE
Dale E. Berg Apr. 1985 20 p refs
(Contract DE-AC04-76DP-00789)
(DE85-011146; SAND-84-1287) Avail: NTIS HC A02/MF A01

Sandia National Laboratories is currently designing a 34-m diameter Darrieus-type vertical axis wind turbine. This turbine will be a research test bed that provides a focus for advancing technology and validating design and fabrication techniques in a size range suitable for utility use. Structural data from this machine will allow structural modeling to be refined and verified for a turbine on which the gravity effects and stochastic wind loading are significant. Performance data from it will allow aerodynamic modeling to be refined and verified. This design effort incorporates Sandia's state-of-the-art analysis tools in the design of a complete machine. The analytic tools being used are described and the conceptual design procedure is summarized, and portions of the detailed design as it existed in September 1984 are presented. DOE

N85-29301# Oak Ridge National Lab., Tenn. Center for Engineering Systems Advanced Research.
HERMIES-1: A MOBILE ROBOT FOR NAVIGATION AND MANIPULATION EXPERIMENTS
C. R. Weisbin, J. Barhen, G. deSaussure, W. R. Hamel, C. Jorgensen, J. L. Lucius, E. M. Oblow, and T. Swift 1985 18 p refs Presented at Robots 9 Conf., Detroit, 2 Jun. 1985
(DE85-008652; CONF-8506106-1) Avail: NTIS HC A02/MF A01

The current status of investigations ongoing at the Center for Engineering Systems Advanced Research (CESAR) in the areas of navigation and manipulation in unstructured environments is reported. The HERMIES-1 mobile robot, a prototype of a series which contains many of the major features needed for remote work in hazardous environments is discussed. Initial experimental work at CESAR has begun in the area of navigation. Since the HERMIES robots will generally be composed of a variety of asynchronously controlled hardware components (such as manipulator arms, digital image sensors, sonars, etc.) it seems appropriate to consider future development of the HERMIES brain as a hypercube ensemble machine with concurrent computation and associated message processing. The basic properties of such a hypercube architecture are presented. DOE

N85-29302# Technische Hogeschool, Delft (Netherlands). Afd. der Luchtvaart- en Ruimtevaarttechniek.
TECHNICAL INSTRUCTIONS FOR A CONTROL OPERATING SYSTEM OF THE GAS FLOW INSTALLATION FOR THE SOLID FUEL COMBUSTION CHAMBER [TECHNISCHE GEBRUIKS-AANWIJZING VOOR HET REGEL/BEDIENINGSSYSTEEM VAN DE GASTOEVOERINSTALLATIE VOOR DE VASTE BRANDSTOF VERBRANDINGSKAMER]
H. Alberts, P. A. O. G. Korting, and J. Versmissen Jan. 1984 237 p ref In DUTCH Sponsored by Stichting voor de Technische Wetenschappen, Projektbureau Energie-Onderzoek, Technische Hogeschool, Delft and Prins Maurits Lab. TNO
(VTH-LR-410; PML-1983-169; SFCC-Publ-8) Avail: NTIS HC A11/MF A01

Operating instructions for a solid fuel combustion chamber control system are given. Author (ESA)

N85-29088# Joint Publications Research Service, Arlington, Va.
COMPONENT PROBLEMS PLAGUE FRENCH ROBOTICS INDUSTRY
Michel Defaux *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-022) 2 Jul. 1984 p 22-30 Transl. into ENGLISH from L'Usine Nouvelle (Paris), 17 May 1984 p 60-66 (For primary document see N85-29086 18-31)
Avail: NTIS HC A04/MF A01

N85-29094# Joint Publications Research Service, Arlington, Va.
MULTINATIONAL PROGRAM TO DEVELOP INTELLIGENT ROBOTS
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031)

11 Sep. 1984 p 33-36 Transl. into ENGLISH from AFP Sci. (Paris), 19 Apr. 1984 p 1-2 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N85-29303 Metals Society, London (England).
INVESTIGATION ON THE APPLICATION OF THE PULSED EDDY CURRENT METHOD OF NON-DESTRUCTIVE TESTING USING CONTROLLED SIGNALS (CS-TECHNIQUE)
H. A. Crostak and J. B. Nehring Nov. 1984 13 p refs Transl. into ENGLISH from Materiqlprufung (West Germay), v. 25, no. 9 p 306-310
(BLL-BISI-Trans-22249-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10; overseas $22.50

Eddy current testing, as noncontacting, nondestructive testing method for thin walled, electrically conducting test objects has acquired increasing industrial and economic significance, e.g., for retesting in nuclear power stations or inspection in the aircraft industry. Author

N85-29304 Metals Society, London (England).
ULTRASONIC TESTING OF TUBES
Jan. 1985 11 p refs Transl. into ENGLISH from various West European articles
(BLL-BISI-Trans-22337-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £13.00; overseas $30.00

Characteristic features of an ultrasonic tube inspection stand are discussed. Also, it is shown that an electrodynamic transducer for generating and receiving ultrasonic waves can be used for thickness measurement. For individual titles, see N85-29305 through N85-29306.

N85-29305 Metals Society, London (England).
CHARACTERISTIC FEATURES OF TESTING EQUIPMENT: APPLICATION TO THE ULTRASONIC INSPECTION OF TUBES
Jean Perdijon *In its* Ultrasonic Testing of Tubes BLL-BISI-Trans-22337-(9022.06) Jan. 1985 p 8 p refs Transl. into ENGLISH of Conf. Paper from Grenoble, France Presented at the 5th Intern. Conf. on Non-Destructive Testing Methods, Bordeaux, 1983 (For primary document see N85-29304 18-38)
Avail: British Library Lending Div., Boston Spa, Engl.: £13.00; overseas $30.00

The characteristic features of an ultrasonic tube inspection stand are discussed. The method applies to nondestructive test methods other than ultrasonics and to products other than tubes. Calibration curves, accuracy, detection limit and speed are discussed. R.J.F.

N85-29306 Metals Society, London (England).
ELECTRODYNAMIC TRANSDUCERS FOR ULTRASONIC RECEPTION
In its Ultrasonic Testing of Tubes BLL-BISI-Trans-22337-(9022.06) Jan. 1985 2 p Transl. into ENGLISH from Materialprufung (West Germany), v. 25, no. 10, 1983 p 364 (For primary document see N85-29304 18-38)
Avail: British Library Lending Div., Boston Spa, Engl.: £13.00; overseas $30.00

It is shown that an electrodynamic transducer for generating and recieving ultrasonic waves can be used for thickness measurement. Since this transducer requires no coupling agnet and has no direct contact with the surface up the test object, it can be employed for thickness gauging whenever technical reasons or cost factors rule out piezoelectric crystals. R.J.F.

N85-29307*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
ULTRASONIC TESTING OF PLATES CONTAINING EDGE CRACKS Final Report
James H. Williams, Jr., Hira Karagulle, and Samson S. Lee Washington NASA Jun. 1985 37 p refs
(Grant NAG3-328)
(NASA-CR-3904; E-2550; NAS 1.26:3904) Avail: NTIS HC A03/MF A01 CSCL 14D

The stress wave factor (SWF) signal is utilized for the nondestructive evaluation of plates containing perpendicular edge cracks. The effects of the existence lateral location and depth of the crack on the magnitude spectra of individual reflections in the SWF signal are studied. If the reflections in the SWF signal are not overlapped the short time Fourier analysis is applied. If the reflections are overlapped the short time homomorphic analysis (cepstrum analysis) is applied. Several reflections which have average resonant frequencies approximately at 0.9, 1.3, and 1.7 MHz are analyzed. It is observed that the magnitude ratios evaluated at average resonant frequencies decrease more with increasing d/h if the crack is located between the transducers, where h is plate thickness and d is crack depth. Moreover, for the plates, crack geometries, reflections, and frequencies considered, the average decibel drop depends mainly on the dimensionless parameter d/h and it is approximately -1 dB per 0.07 d/h. Changes in the average resonant frequencies of the magnitude spectra are also observed due to changes in the location of the crack. B.W.

N85-29308# Wisconsin Univ., Madison. Mathematics Research Center.
STUDIES IN QUALITY IMPROVEMENT. PART 1: DISPERSION EFFECTS FROM FRACTIONAL DESIGNS, REVISED Summary Report
George E. P. Box and R. Daniel Meyer Feb. 1985 24 p Previously announced as N85-19760-Rev
(Contract DAAG29-80-C-0041)
(AD-A153516; MRC-TSR-2796) Avail: NTIS HC A02/MF A01 CSCL 07/4

Fractional factorial designs have been used successfully in industry and elsewhere to detect and estimate sparse factor effects. The effects usually envisioned measure changes in location associated with the experimental factors. In this paper we consider the possibility of detecting and estimating sparse dispersion effects measuring changes in variance associated with the factors. GRA

N85-29309# Martin Marietta Aerospace, Orlando, Fla.
RELIABILITY DERATING PROCEDURES Final Technical Report, Feb. 1983 - May 1984
D. J. Eskin and C. R. McCanless Griffiss AFB, N.Y. RADC Dec. 1984 308 p
(Contract F30602-83-C-0006)
(AD-A153744; RADC-TR-84-254) Avail: NTIS HC A14/MF A01 CSCL 14/4

The objectives of this study were the establishment of derating parameters and levels for electronic parts, development of thermal models, creation of temperature verification methods, and the development of the framework leading to the creation of a military standard for derating of parts. The results of this study revealed that derating data on complex devices are difficult to obtain so an alternate approach was used involving failure rate data from MIL-HDBK-217 and specific failure mode information. Thermal models, both internal and nodal, were developed for six package types and temperature tests results for one of these types were compared to the theoretical value. The comparison was extremely favorable. The objective of the reliability derating procedures program was to develop the framework leading to the creation of a military standard for the derating of electronic and electromechanical devices for Air Force application. Primary areas of investigation are: (1) relationship of case temperatures to junction temperatures, (2) methods of verifying that derating has been accomplished, (3) relationship of reliability to cost, (4) derating standards

for complex devices, and (5) creation and verification techniques through data collection and testing. GRA

N85-29310# Sandia Labs., Albuquerque, N. Mex. Div. 7552.
ULTRASONIC TEST EVALUATION OF THE INSERT BOND ON HERMETIC CONNECTORS
P. D. Walkington Feb. 1985 69 p
(Contract DE-AC04-76DP-00789)
(DE85-008394; SAND-84-1637) Avail: NTIS HC A04/MF A01

Two ultrasonic test procedures were developed to evaluate the bond between the blue insert socket support and glass in hermetic connectors. A control group of cylindrical-hermetic SA connectors was assembled with known defects and processing anomalies and evaluated by two ultrasonic test methods and an insert pull test. Both ultrasonic test methods identified a good/bad bond between the insert and glass; however, no correlation is found between the ultrasonic test results and the insert pull test results. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N85-29311 Metals Society, London (England).
BRITTLE FRACTURE BEHAVIOUR OF COLD FORMED, WELDED 10mm TO 20 mm THICK PLATE MANUFACTURED FROM PLAIN CARBON STRUCTURAL STEELS
P. Pech and F. Potthoff Jan. 1985 12 p refs Transl. into ENGLISH from Schweissen Schneiden (West Germany), v. 30, no. 2 p 41-44
(BLL-BISI-Trans-21678-(9022.06)) Avail: British Library Lending Div., Boston Spa, Engl.: £10; overseas $22.50

The influence of welding upon the embrittlement of the cold-formed structural steels RSt 37-2, USt 37-2, St 52-3 and WTSt 52-3, with plate thickness of 12 mm to 20 mm is investigated in impact bending tests at temperatures of -30 deg C (-50 deg C) under conditions closely resembling actual practice. Depending on the amount of deformation, the boundaryline separating the ductile from the brittle fracture behaviour of the materials can be defined. Permissible deformations can therefore be quoted without insisting on a wide margin of safety. A number of recommendations concerning DIN 4100 based on these results are submitted. R.J.F.

N85-29312 Communications Research Centre, Ottawa (Ontario). Space Technology and Applications Branch.
A NATURAL MODES FORMULATION AND MODAL IDENTITIES FOR STRUCTURES WITH LINEAR VISCOUS DAMPING
F. R. Vigneron Jan. 1985 27 p refs
(CRC-1382) Avail: Issuing Activity

A modal model is developed for an elastic structure with linear viscous damping. The transfer functions and normalizations that are of use in experimental modal parameter estimation are given special attention. Procedures for extraction of damped natural modes from experiment derived residues are outlined. Mass properties related modal identities are obtained for the damped modes. Author

N85-29313# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
STRUCTURAL ANALYSIS
Nov. 1984 365 p refs In GERMAN and ENGLISH Colloq. held at Brunswick, 4 Jun. 1987 Report will also be announced as translation (ESA-TT-917)
(DFVLR-Mitt-84-21; ISSN-0176-7739) Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

Coupling of tension and torsion in rods; field consistency in finite element analysis; buckling and post-buckling behavior of shallow shells; optimization of axially compressed carbon fiber reinforced plastic cylinders; a substructure technique applied to fracture mechanics of composites; stress intensity factors as indicators of crack propagation in unidirectional laminates; and static aeroelastic phenomena of composite wings are discussed. For individual titles, see N85-29314 through N85-29321.

N85-29314# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
RESEARCH ON STRUCTURAL ANALYSIS AT THE DFVLR, BRUNSWICK
Bodo Geier *In* DFVLR Struct. Anal. Nov. 1984 p 9-40 refs In GERMAN; ENGLISH summary (For primary document see N85-29313 18-39)
Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

The science of structural mechanics is reviewed, emphasizing computational problems in aerospace research. Lightweight construction with composite materials is defined as the central topic. In an assessment of the present state of the art, it is concluded that a very satisfactory situation is achieved in the analysis of linear problems, but not in the solution of nonlinear problems and in structural optimization. Author (ESA)

N85-29315# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
TORSION-TENSION COUPLING IN RODS
Dieter Petersen *In its* Struct. Anal. Nov. 1984 p 41-72 refs In GERMAN; ENGLISH summary (For primary document see N85-29313 18-39)
Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

The treatment of torsion-tension coupling in rods under finite deformations is discussed. Analyses containing higher order terms due to geometric nonlinearities show inconsistency. The differences of three analyses are discussed via numerical examples. Extremely light constructions in aviation and astronautics can neither abandon rod structures nor give up the demand for a more precise analysis. Author (ESA)

N85-29316# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
FIELD CONSISTENCY AND THE FINITE ELEMENT ANALYSIS OF MULTIFIELD STRUCTURAL PROBLEMS
Gangan Prathap *In its* Struct. Anal. Nov. 1984 p 73-139 refs (For primary document see N85-29313 18-39)
Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

A terminology for errors resulting from finite element analysis in structural analysis is introduced. The problem area - continuum field problems requiring a multifield characterization in which some field functions are constrained - is identified and defined. The requirement of field consistency is introduced and joins the principles used in the construction of efficient finite element methods. The concept of errors of the second kind delineating a special form of discretization error, and the additional stiffness parameter help to make a posteriori evaluations of such finite elements - with or without locking. Theory and analysis of physical examples, namely the poor bending response of plane stress elements, shear-flexible beam plates (shear locking), and curved elements (membrane locking); and incompressible elasticity and fluid flow are given. Techniques to introduce field consistency are explained: unequal order interpolation, reduced integration, reduced interpolation, and addition of incompatible modes.
Author (ESA)

N85-29317# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
BUCKLING AND POSTBUCKLING BEHAVIOR OF SHALLOW SHELLS
Klaus Rohwer *In its* Struct. Anal. Nov. 1984 p 141-197 refs In GERMAN; ENGLISH summary (For primary document see N85-29313 18-39)
Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

Computer programs to study the buckling and postbuckling behavior of shallow shells were developed. Mesh wise bicubic

interpolation is used to discretize the total potential energy. The minima of the resulting polynomial of fourth order, determined by the computer program NOLIN, specify stable equilibrium states in the geometric nonlinear range. The program BEOS determines bifurcation buckling loads, and from a perturbation analysis finds an approximate initial postbuckling behavior. Comparing the results of the two programs shows that this approximation is not in all cases sufficient to describe the nonlinear behavior. Author (ESA)

N85-29318# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
OPTIMIZATION OF AXIALLY COMPRESSED CARBON FIBER REINFORCED PLASTIC (CFRP) CYLINDERS
Rolf Zimmermann *In its* Struct. Anal. Nov. 1984 p 199-225 refs In GERMAN; ENGLISH summary (For primary document see N85-29313 18-39)
Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

The numerical optimization of axially compressed CFRP cylinders was investigated. The mass minimization of axially compressed CFRP cylindrical shells which may fail due to buckling or loss of material strength, is replaced by a sequence of buckling load maximizations. The layer orientations are used as variables to be changed continuously and discretely. The results show that the optimal orientations are independent of the parameters describing the cylinder. Findings concerning sensitivity and numerical and experimental studies of validity limits are given. Author (ESA)

N85-29319# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
AN EFFECTIVE SUBSTRUCTURE TECHNIQUE APPLIED TO CRACK PROBLEMS
Hans Eggers *In its* Struct. Anal. Nov. 1984 p 227-294 refs In GERMAN; ENGLISH summary (For primary document see N85-29313 18-39)
Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

A specialized substructure technique was developed to solve crack problems, whereby the linearly elastic uncracked structure is limited by conditions describing the cracking. The common methods to determine the stress intensity factors in cracked structures and their accuracy are discussed. The treatment of the material and structural nonlinearity by scalar conditions, which constrains a functional for the linearly elastic structure, is introduced. The finite transformation of the constrained functional yields the usual equations for the linearly elastic structure, as well as equations for the constraints. With increasing damage only the newly added equations for the constraints must be solved. The substructure technique determines the reduced element matrices and the load cracks directly in solving the equations. Author (ESA)

N85-29320# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
CRACK PROPATION IN UNIDIRECTIONAL LAMINATES BY THE STRESS INTENSITY FACTORS
Rolf Zick *In its* Struct. Anal. Nov. 1984 p 295-318 refs In GERMAN; ENGLISH summary (For primary document see N85-29313 18-39)
Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

Based on test results with notched unidirectional laminates, critical values of the stress intensity factors K1 and K2 were determined. They represent characteristic values for the material properties and form an envelope $f(K1, K2) = 0$. Any stress state with $f(K1, K2) > \text{or} = 0$ leads to further crack propagation. Methods to determine the stress intensity factors from the stress and displacement field, which are computed using a finite element method, are indicated. Author (ESA)

N85-29321# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.
THE STATIC AEROELASTICITY OF A COMPOSITE WING
Matthias Piening *In its* Struct. Anal. Nov. 1984 p 319-364 refs In GERMAN; ENGLISH summary (For primary document see N85-29313 18-39)
Avail: NTIS HC A16/MF A01; DFVLR, Cologne DM 95

A procedure for parametric investigations of the static-aeroelastic behavior of anisotropic wings with average to large aspect ratio was developed. By exploiting the directional stiffness properties of a composite material, coupling of bending and torsional deformations can be achieved. This can be used to influence the spanwise lift distribution, the internal structural forces, and the permissible flying speeds limited by the aeroelastic behavior of the wing. Static divergence can be avoided and forward wing sweep can be realized. The differential equations describing the aeroelastic behavior of a beamlike wing structure are solved by applying the multiple shooting method. Examples show the effects of fiber orientations on lift distributions of a composite wing. Author (ESA)

N85-29322# Utah Univ., Salt Lake City. Dept. of Civil Engineering.
FATIGUE BEHAVIOR OF UNIDIRECTIONAL FP-Al COMPOSITES WITH CIRCULAR HOLES Final Report, 21 Jul. 1980 - 20 Jul. 1983
George J. Dvorak Nov. 1984 90 p refs
(Contract DAAG46-80-C-0059; DA Proj. 1L1-62105-AH-84)
(AD-A153466; F870002; AMMRC-TR-84-44) Avail: NTIS HC A05/MF A01 CSCL 20/11

This investigation examines the response of the FP-Al system under both tensile and compressive cyclic loads, and also in the presence of circular holes. A related analysis of elastic-plastic deformation of the specimens under cyclic loading has been performed and used in interpretation of the experimental data. Of particular interest here was an examination of the relationship between shakedown and onset of fatigue damage in the aluminum matrix. Magnitudes of fiber stress in the vicinity of the circular holes under cyclic loading were evaluated as well. The fatigue damage modes, under various loading conditions were also examined. This report describes the experimental program, its results, the plasticity analysis of test specimens, and interpretation of the experimental data. GRA

N85-29323# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
INTERACTION OF LARGE AMPLITUDE STRESS WAVES IN LAYERED ELASTIC-PLASTIC MATERIALS Final Report, Dec. 1981 - Dec. 1984
Eric Varley Feb. 1985 7 p
(Contract DAAG29-82-K-0027)
(AD-A153519; ARO-18646.2-EG) Avail: NTIS HC A02/MF A01 CSCL 20/11

Mathematical techniques are developed to analyze the nonlinear wave interactions that occur in both elastic and visco-plastic solids. Representations are also derived to describe small amplitude stress waves in materials whose transmitting properties vary in space and time. Author (GRA)

N85-29324# California Univ., Los Angeles. School of Engineering and Applied Science.
STATISTICAL FRACTURE THEORIES FOR BRITTLE MATERIALS Final Report
S. B. Batdorf and G. Sines 17 Jan. 1985 11 p
(Contract N00014-76-C-0445)
(AD-A153530) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document describes statistical fracture theories for brittle materials. GRA

N85-29325# Aeronautical Research Labs., Melbourne (Australia).
DESCRIPTION AND ILLUSTRATION OF THE USE OF CRACKS IV
C. S. Dentry Aug. 1984 62 p
(AD-A153543; ARL/STRUC-TM-389) Avail: NTIS HC A04/MF A01 CSCL 20/11

This Memorandum provides an explanation of the procedure required to implement the computer program CRACKS IV for the

calculation of crack growth rates. The procedure is illustrated by means of sample calculations. Author (GRA)

N85-29326# Naval Research Lab., Washington, D. C.
FATIGUE BEHAVIOR OF HY-130 STEEL WELDMENTS CONTAINING FABRICATION DISCONTINUITIES
S. J. Gill, J. A. Hauser, II, T. W. Crooker, B. J. Kruse, and R. Menon 18 Apr. 1985 39 p
(NR Proj. RR0-2201)
(AD-A153630; NRL-MR-5520) Avail: NTIS HC A03/MF A01 CSCL 20/11

Fabrication discontinuities in weldments pose a serious engineering problem for structural applications involving cyclic loading. Often, the discovery of fabrication discontinuities through nondestructive inspection can pose a dilemma; if not properly repaired, failure can result from crack initiation and growth, however, if improperly repaired, post-repair discontinuities of even greater severity may result. Thus, a need exists for rational decision-making criteria to assess the mechanical severity of actual fabrication defects in weldments. This study was undertaken to explore the applicability of linear elastic fracture mechanics to characterize the fatigue behavior of high-strength steel weldments containing lack-of-penetration (LOP) and slag/lack-of-fusion (S/LOF) discontinuities. Full penetration, double-V butt welds with reinforcements removed were tested under zero-to-tension axial loading. Various filler metals and welding techniques were used. Both sound welds and welds containing discontinuities were cycled to failure. Whenever possible, cycles to crack initiation were estimated by strain gage measurements. The fracture mechanics approach was successful in correlating the fatigue lifetimes of specimens containing single LOP discontinuities of varying size. However, the fatigue behavior of specimens containing multiple S/LOF discontinuities proved to be much more complex and difficult to analyze. GRA

N85-29327# Naval Postgraduate School, Monterey, Calif.
ROLLING CONTACT FATIGUE TESTING OF THERMOMECHANICALLY PROCESSED M-50 STEEL M.S. Thesis
F. A. Butterfield, III Dec. 1984 104 p
(AD-A153640) Avail: NTIS HC A06/MF A01 CSCL 20/11

The influence on rolling contact fatigue behavior of thermomechanical processing (TMP) to refine grain and soluble carbide size was studied in this work on VIM-VAR M-50 steel. Material was processed (austenitized and warm-rolled) following the procedures developed by Larson, with subsequent austenitization times and temperature (for final hardening) based on Bres' data. Rolling contact fatigue testing indicates virtual equivalence of the as-received (spheroidize-annealed) and TMP specimens evaluated, with the TMP material clearly no better than the as-received condition in terms of fatigue life. This is believed to be the result of one or both of the following: (1) austenitization (hardening) of TMP material at too long a holding time, with a microstructural equalization occuring between conditions; and (2) voids existing at the ends of insoluble carbides in both as-received and TMP material, which act as possible sites for crack initiation in the matrix. GRA

N85-29328# Southwest Research Inst., San Antonio, Tex.
STUDY OF THE INFLUENCE OF METALLURGICAL FACTORS ON FATIGUE AND FRACTURE OF AEROSPACE STRUCTURAL MATERIALS Annual Scientific Report, 1 Jan. - 31 Dec. 1984
James Lankford, David L. Davidson, Gerald R. Leverant, and Kwai S. Chan Feb. 1985 48 p refs
(Contract F49620-83-C-0054)
(AD-A153913; SwRI-7436; AFOSR-85-0372TR) Avail: NTIS HC A03/MF A01 CSCL 20/11

This report summarizes the results of a study involving: (1) experimental characterization and analytical modeling of fatigue crack tip micromechanics in aerospace structural (aluminum and titanium) alloys; and (2) identifying and modeling key factors controlling subcritical crack growth and unstable fracture in single crystal nickel-base superalloys. The first section summarizes studies in which measured crack tip parameters and microstructural characterization are incorporated into a recently developed crack tip geometric model which interrelates microstructure with fatigue crack growth. The model is used with 7075-T651 Al, 7091 P/M Al, and Ti-6Al-4V to predict crack growth increments (striation spacings), which are then compared with experimental measurements for the Al alloys. Additional crack tip characterization was performed on an experimental high temperature aluminum alloy (HTAL). By using a recently developed SEM high temperature cycling stage, crack tip yielding and extension was characterized at 315 C, which showed that the interfaces of certain microstuctural elements unique to the HTAL alloy were detrimental to its resistance to elevated temperature fatigue crack growth. The second section describes results of ambient temperature crack growth tests of single crystal Mar-M200. Tests were carried out as functions of stress intensity range, normal stress to shear stress ratio, and crystallographic orientation, and their efect on mode of cracking and crack growth characteristics was established. GRA

N85-29329# Brown Univ., Providence, R. I. Metals Research Lab.
STUDIES OF STRAIN RATE EFFECTS IN THE DEFORMATION OF SOLIDS BY MEANS OF STRESS PULSES AND ULTRASONIC METHODS Progress Report, 1 Sep. 1983 - 31 Mar. 1984
M. Han, A. Hikata, and C. Elbaum 30 Nov. 1984 45 p refs
(Contract DE-AC02-83ER-45018)
(DE85-009463; DOE/ER-45018/1) Avail: NTIS HC A03/MF A01

Stress, strain and strain rate sensitivity mechanisms in the plastic deformation of solids were studied by subjecting samples to short duration (approx. = 200 (MU)s) stress pulses and simultaneously measuring changes of attenuation and phase (i.e., wave propagation velocity) of an ultrasonic wave. Stress pulses are applied by means of a split Hopkinson bar. The materials used to-date were irradiated and annealed LiF single crystals, Al single crystals and a polycrystalline, commercial Al alloy. Elastic deformation, the onset of plastic deformation and subsequent strain hardening are correlated with measured ultrasonic attenuation changes DELTA ALPHA and phase changes DELTA theta. Double peaks in attenuation changes, tentatively attributed to anelastic effects, were discovered in LiF single crystals. DOE

N85-29330# Massachusetts Inst. of Tech., Cambridge.
YIELD STRESS DETERMINATION FROM MINIATURIZED DISK BEND TEST DATA
D. S. Sohn, G. Kohse, and O. K. Harling Apr. 1985 6 p refs
(Contract DE-AC02-78ER-10107)
(DE85-009495; DOE/ER-10107/26) Avail: NTIS HC A02/MF A01

This paper describes the analysis of load/deflection data from such miniaturized disk bend tests (MDBT) using a finite element simulation. Good simulation has been achieved up to a point just beyond the predominantly elastic response, linear initial region. The load at which deviation from linearity begins has been found to correlate with yield stress, and yield stress has been successfully extracted from disk bend tests of a number of known materials. Although finite element codes capable of dealing with large strains and large rotations have been used, simulation of the entire load/deflection curve up to fracture of the specimen has not yet been achieved. DOE

N85-29331# Cornell Univ., Ithaca, N.Y. Dept. of Materials Science and Engineering.
A STATE VARIABLE APPROACH TO TRANSIENT CREEP DEFORMATION IN STRESS REDUCTION EXPERIMENTS
M. A. Korhonen, J. C. Gibeling (Stanford Univ.), and C.-Y. Li 21 Mar. 1985 38 p refs
(Contract DE-FG02-84ER-45055)
(DE85-009492; DOE/ER-45005/4) Avail: NTIS HC A03/MF A01

Stress reduction experiments were used to explore the internal state of a creeping material. Data from stress reduction experiments are used to generate parameters for state variable models that are verified by other means. The predictions of a state variable approach to stress reduction experiments are explored and compared to previously published data. The state variable model

is shown to give a consistent description of the processes involved during the transient deformation, and the predictions and the model parameters are found to compare well with the data obtained by other means. DOE

N85-29332# Burns and Roe, Inc., Oradell, N. J.
BEHAVIOR OF REINFORCED CONCRETE AT ELEVATED TEMPERATURES
George N. Freskakis Sep. 1984 34 p refs Presented at ASCE Conf. on Struct. Eng. in Operating Nucl. Facilities, Raleigh, N.C., 10 Sep. 1984
(Contract DE-AC15-76CL-98004)
(DE85-009032; DOE/CL-98004/34; CONF-840913-8) Avail: NTIS HC A03/MF A01

A study is presented concerning the behavior of reinforced concrete sections at elevated temperatures. Material properties of concrete and reinforcing steel are discussed. Behavior studies are made by means of moment-curvature-axial force relationships. Particular attention is given to the load carrying capacity, thermal forces and moments, and deformation capacity. The effects on these properties of variations in the strength properties, the temperature level and distribution, the amount of reinforcing steel, and limiting values of strains are considered. DOE

N85-29333# National Centre of Tribology, Risley (England). European Space Tribology Lab.
OBSERVATIONS OF HIGH RESISTANCE ON SLIP-RINGS EMPLOYING Ag/MoS2/Cu BRUSHES Interim Report
E. W. Roberts Sep. 1984 34 p refs
(Contract ESA-5615/83-NL-PP)
(ESA-ESTL-70; ESA-CR(P)-1989) Avail: NTIS HC A03/MF A01

The effect of ground testing and storage on the corrosion resistance of slip rings comprising Ag/MoS2/Cu composite brushes and gold plated rings was tested, using solar array drive mechanisms, one of which underwent extensive ground testing. Both sets of slip rings exhibit discrete points of high resistance (> 1 Kohm) but resistances of this magniture are only observed across brush/ring contacts on the extensively tested drive. High resistance points are most numerous within vibration marks (i.e., places where the brushes rested during vibration testing). Surface analysis of areas of of high resistance reveals silver sulfide, molybdenum disulfide and other components attributable to brush wear debris. Author (ESA)

N85-29334# Technische Hogeschool, Delft (Netherlands). Afd. der Lucht-en Ruimtevaarttechniek.
MECHANICS OF COMPOSITE MATERIALS, THEORY AND APPLICATION [MECHANICA VAN COMPOSIETMATERIALEN THEORIE EN TOEPASSING]
Jun. 1984 184 p refs In DUTCH
(VTH-LR-431) Avail: NTIS HC A09/MF A01

Composite materials stress, deformation, and the relation between them are introduced. Laminates, stress concentration in anisotropic plates, cracks, case constructions, and the wrapping of pressure vessels are treated. Author (ESA)

N85-29335# Vereinigte Aluminium-Werke A.G., Bonn (West Germany). Leichtmetall Forschungsinstitut.
ALUMINUM PRESSURE DIE CASTING PROCESS FOR THE PRODUCTION OF LOW POROSITY CASTINGS AND NEW CASTING ALLOYS Final Report, Dec. 1983
Herbert Woithe Bundesministerium fuer Forschung und Technologie Dec. 1984 74 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-286; ISSN-0340-7608) Avail: NTIS HC A04/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 15.50

A vacuum pressure die casting process with a self-charging horizontal cold chamber machine was developed to produce castings poor in oxide and porosity. The castings can be solution treated at elevated temperatures, welded, and coated. The cold deformability after specific heat treatment is excellent. Layers with higher wear resistance are achieved by hard anodizing due to the uniform layer structure. Because of the heat treatability of the castings, in conjunction with selected alloys that are not typical of pressure die casting, it is possible to obtain a wide spectrum of strength and toughness properties. This opens possibilities for application of aluminum pressure die casting. Author (ESA)

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N85-29336* National Aeronautics and Space Administration, Washington, D. C.
EARTH RESOURCES: A CONTINUING BIBLIOGRAPHY WITH INDEXES, ISSUE 45
Apr. 1985 138 p
(NASA-SP-7041(45); NAS 1.21:7041(45)) Avail: NTIS HC $12.00 CSCL 05B

This bibliography lists 494 reports, articles and other documents introduced into the NASA scientific and technical information system between January 1 and March 31, 1985. Emphasis is placed on the use of remote sensing and geophysical instrumentation in spacecraft and aircraft to survey and inventory natural resources and urban areas. Subject matter is grouped according to agriculture and forestry, environmental changes and cultural resources geodesy and cartography, geology and mineral resources, hydrology and water management, data processing and distribution systems, instrumentation and sensors, and economical analysis. Author

N85-29337 Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
INFORMATION RELATIVE TO CARTOGRAPHY AND GEODESY. SERIES 2: TRANSLATIONS, NUMBER 42, VOLUME 2
1984 7 p Original contains maps Original contains color illustrations 2 Vol.
(ISSN-0469-4244) Avail: Issuing Activity

Two NOAA 7 satellite maps of Central Europe in color; a black and white NOAA 7 map of Antarctica; and two color maps illustrating Antarctic exploration are presented. Author (ESA)

N85-29338# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
INFORMATION RELATIVE TO CARTOGRAPHY AND GEODESY. SERIES 2: TRANSLATIONS, NUMBER 42, VOLUME 1
1984 49 p refs
(ISSN-0469-4244) Avail: NTIS HC A03/MF A01

The NOAA 7 satellite imagery mapping of Central Europe and Antarctica, the significance of orthophoto maps for developing nations, and German contributions to Antarctic cartography by photogrammetry and remote sensing are discussed. For individual titles, see N85-29339 through N85-29342.

N85-29339# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
TWO SATELLITE IMAGE MAPS OF CENTRAL EUROPE
Uwe Buecher, Wolfgang Goepfert, Wigand Weber, and Ingo Wilski *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl., No. 42, Vol. 1 1984 p 5-10 refs (For primary document see

N85-29338 18-43)
Avail: NTIS HC A03/MF A01

Two satellite image maps of Central Europe at 1:3 million scale were produced using computer techniques. The technology, data sources, and hardware systems used for their production are described. Author (ESA)

N85-29340# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DIGITAL IMAGE MAPPING OF ANTARCTICA USING NOAA-7 AVHRR IMAGERY
Wolfgang Goepfert *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl., No. 42, Vol. 1 1984 p 11-16 refs (For primary document see N85-29338 18-43)
Avail: NTIS HC A03/MF A01

Satellite image map production from NOAA-7 AVHRR imagery is described. The digital image processing steps are involved, i.e., the 10 bit/8 bit-reformatting of the raw data. The geometric and radiometric image mosaicing, and a final global contrast enhancement are described. A digital image mosaic of scale 1:6 million of the Antarctic region 110 W - 0 - 90 E, 70 - 90 S is presented. Author (ESA)

N85-29341# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE SIGNIFICANCE OF ORTHOPHOTO MAPS FOR DEVELOPING COUNTRIES
Johannes Nittinger *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl., No. 42, Vol. 1 1984 p 17-28 refs (For primary document see N85-29338 18-43)
Avail: NTIS HC A03/MF A01

Orthophoto maps as planning tools are discussed. They can also be used as a basis for cadastral maps and for the recording of land register data. This is demonstrated by examples from Thailand, Central America, and Haiti. Author (ESA)

N85-29342# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
GERMAN CONTRIBUTIONS TO THE CARTOGRAPHY OF ANTARCTICA BY MEANS OF PHOTOGRAMMETRY AND REMOTE SENSING
Heinz Schmidt-Falkenberg *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl., No. 42, Vol. 1 1984 p 29-48 refs (For primary document see N85-29338 18-43)
Avail: NTIS HC A03/MF A01

Exploration of the Antarctic and cartographic activities by Germany before 1945 are reviewed, including the Antarctic Expedition of 1938/39 and the first use of aerial survey cameras by a German team. Activities after 1945, in the topographic-chorographic cartography of the Antarctic and the establishment and revision of a Digital Name File Antarctica in German are described. Activities planned by the Federal Republic of Germany in the Antarctic in photogrammetry and remote sensing are outlined. Author (ESA)

N85-29343# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY. SERIES 1: ORIGINAL REPORTS, NUMBER 93 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE, HEFT NR 93]
1984 111 p refs In GERMAN; ENGLISH summary Original contains color illustrations
(ISSN-0469-4236) Avail: NTIS HC A06/MF A01

An operational procedure for the universal, dynamic, geometric rectification of perturbed airborne scanner digital image recordings is presented. An information-theoretical method for automatic noise elimination in digital image processing is discussed. For individual titles, see N85-29344 through N85-29345.

N85-29344# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DYNAMIC RECTIFICATION OF AIRBORNE SCANNER DIGITAL IMAGE RECORDINGS [DYNAMISCHE ENTZERRUNG VON FLUGZEUGABTASTER-BILDAUFZEICHNUNGEN]
Klaus-Juergen Seegel *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 93 1984 p 7-80 refs In GERMAN; ENGLISH summary (For primary document see N85-29343 18-43)
Avail: NTIS HC A06/MF A01

An operational procedure for the universal geometric rectification of perturbed digital image recordings is presented. Developments in preprocessing, as e.g., noise elimination, strict radiometric adaptation as well as the production of data-reduced edge images allow a clear, distinct and complete visualization of the geometric deviations and an appropriate interactive rectification. The direct comparison of edge images covering the same area between the reference image and the image to be rectified simplifies the quality control of the real time rectification and offers the possibility to increase at will the accuracy by iterative processing by additional measurements. The total procedure is demonstrated by the rectification of a multispectral airborne scanner recording onto a panchromatic digital orthophoto. Author (ESA)

N85-29345# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
AN INFORMATION THEORETICAL METHOD FOR AUTOMATIC NOISE ELIMINATION IN DIGITAL IMAGE PROCESSING [EIN INFORMATIONSTHEORETISCHER ANSATZ ZUR AUTOMATISCHEN RAUSCHBESEITIGUNG IN DER DIGITALEN BILDVERARBEITUNG] c35
Klaus-Juergen Seegel *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 93 1984 p 81-108 refs In GERMAN; ENGLISH summary Original contains color illustrations (For primary document see N85-29343 18-43)
Avail: NTIS HC A06/MF A01

A universal noise elimination method based on systems and information theoretical considerations was developed. Versatility and problems of noise elimination are demonstrated and defined according to sources. The method of redundancy reduction is specified. The advantages of this spatial and frequency autonomous operation enable universal applications of redundancy reduction. The effects on digital halftone images are verified by samples of different origin and structure. The application of this method for noise elimination and non-noise related reductions is discussed. Author (ESA)

N85-29346# Army Cold Regions Research and Engineering Lab., Hanover, N. H.
PERMAFROST, SEASONALLY FROZEN GROUND, SNOW COVER AND VEGETATION IN THE USSR
S. R. Bigl Dec. 1984 133 p
(AD-A153628; CRREL-SR-84-36) Avail: NTIS HC A07/MF A01 CSCL 08/12

A survey of the Cold Regions Science and Technology Bibliography and other references in the CRREL library was conducted to compile recent information about several Soviet physiogeographic features: permafrost, seasonally frozen ground, snow cover and vegetation. The products of the study are: (1) a series of maps presenting the general distribution of these features over the entire Soviet Union, and (2) a collection of 57 maps showing the local distribution of ground ice and permafrost. GRA

N85-29347# Army Engineer Topographic Labs., Fort Belvoir, Va.
AIR PHOTO ANALYSIS, PHOTO INTERPRETATION LOGIC, AND FEATURE EXTRACTION
Jack N. Rinker and P. A. Corl Jun. 1984 351 p refs
(DA Proj. 4A1-61102-B-52-C; DA Proj. 4A7-62707-A-855)
(AD-A153926; ETL-0329) Avail: NTIS HC A16/MF A01 CSCL 14/5

This is a status report about some of the research efforts within the Center for Remote Sensing (CRS) that are associated with image analysis. Emphasis has been placed on the manual procedure of photo analysis, photo interpretation logic, classification schemes, and knowledge based systems. Information derived from other sources and information presented by contributors are acknowledged in the appropriate sections. GRA

N85-29348# Pacific Northwest Lab., Richland, Wash.
IDENTIFICATION AND CHARACTERIZATION OF WATERSHED MODELS FOR EVALUATION OF IMPACTS OF CLIMATE CHANGE ON HYDROLOGY
J. M. Shafer and R. L. Skaggs May 1984 34 p refs
(Contract DE-AC06-76RL-01830)
(DE85-008575; PNL-21-12372) Avail: NTIS HC A03/MF A01

There is growing concern that increases in the ambient concentration of atmospheric CO2 will effectuate a significant change in the distribution of global precipitation as global temperatures rise. The identification and characterization of rainfall/snowmelt-runoff modeling capability is conducted to research the effects of a carbon dioxide-induced climate change on hydrology. To understand the effects of climate change on the supply and use of freshwater resources, it is necessary to understand the effects of climate change on hydrology, particularly runoff. The three general categories of watershed models reviewed are transfer functions, lumped parameter models, and distributed parameter models. Within each general classification specific watershed models that are publicly available and implementable on digital computers are reviewed in detail. Key factors in the model characterization are the component hydrologic processes, if any, each model addressed along with its climatology/meteorology-related input data requirements. DOE

N85-29349# California Univ., Livermore. Lawrence Livermore Lab.
IMPROVED MODEL FOR FLUID-DRIVEN CRACKS IN JOINTED ROCK
R. J. Shaffer, A. R. Ingraffea (Cornell Univ., Ithaca, N.Y.), and F. E. Heuze 1985 9 p refs Presented at 26th US Symp. on Rock Mech., Rapid City, S.D., 26-28 Jun. 1985
(Contract W-7405-eng-48)
(DE85-008963; UCRL-92316; CONF-850671-14) Avail: NTIS HC A02/MF A01

The finite element model FEFFLAP (Finite Element Fracture and Flow Analysis Program) is being developed for and applied to hydrofracture analyses in support to the Unconventional Gas Recovery Program at the Lawrence Livermore National Laboratory. The major characteristics of FEFFLAP were presented earlier. Two improvements made to the model are presented here: a multiple load capability and a selection of minimum aperture for fluid flow. The results of two verification and example problems are also given. DOE

N85-29350# Geological Survey, Lakewood, Colo.
CONCEPTUAL HYDROLOGIC MODEL OF FLOW IN THE UNSATURATED ZONE, YUCCA MOUNTAIN, NEVADA
Parviz Montazer and William E. Wilson 1984 59 p refs
(Contract DE-AI08-78ET-44802)
(DE85-006346; USGS/WRI-84-4345) Avail: NTIS HC A04/MF A01

The purpose of this report is to propose a conceptual hydrologic model that reasonably describes the flow of fluids through the unsaturated zone at Yucca Mountain, for use as a basis for preliminary site-performance assessment and as a guide to further investigations. The model describes the manner in which flow probably occurs at Yucca Mountain and is based on: (1) current understanding of the hydrogeologic framework; (2) application of the principles of unsaturated flow; and (3) interpretation of some preliminary data from ongoing field and laboratory investigations. Included are extensive geologic information but relatively few hydrologic data that currently exist from the unsaturated zone in the Yucca Mountain area. Although various alternative models probably could be developed, the one described in this report seems to fit current understanding of the unsaturated flow through a section of layered, fractured-rock formations with contrasting hydrologic properties, such as occurs at Yucca Mountain. DOE

N85-29351# Battelle Memorial Inst., Argonne, Ill. Office of Crystalline Repository Development.
[REVISED DRAFT: SOUTHEASTERN REGIONAL GEOLOGIC CHARACTERIZATION REPORT]
Nov. 1984 596 p refs
(DE85-008285; DOE/CH-6(2)-App-C; DOE/CH-6(2)-App-D) Avail: NTIS HC A25/MF A01

Appendix C provides a compilation of the historial and instrumental seismic record for the southeastern United States. Table C-1 is a catalog of all earthquakes in the southeastern United States from the year 1968 through 1981. Table C-2 is a listing of the aftershocks and earthquakes recorded in the Charleston-Summerville, South Carolina area from Tabor (1914), as listed by Bollinger (1975). Table C-3 lists the seismic events recorded in Trotter's diary for Charleston-Summerville, South Carolina, listed by US Geological Survey. Appendix D contains a compilation of rock and mineral resource data for the states of Georgia, Maryland, North Carolina, South Carolina, and Virginia. DOE

N85-29352# RE/SPEC, Inc., Albuquerque, N. Mex.
INTERIM ROCK MASS PROPERTIES AND CONDITIONS FOR ANALYSES OF A REPOSITORY IN CRYSTALLINE ROCK
Hans Y. Tammemagi and Jack D. Chieslar Mar. 1985 92 p refs
(Contract DE-AC02-83CH-10139)
(DE85-010700; BMK/OCRD-18) Avail: NTIS HC A05/MF A01

A summary of rock properties for generic crystalline rock is compiled from literature sources to provide the input data for analyses of a conceptual repository in crystalline rock. Frequency histograms, mean values and ranges of physical, mechanical, thermal, and thermomechanical properties, and the dependence of these properties on temperature are described. A description of the hydrogeologic properties of a crystalline rock mass and their dependence on depth is provided. In addition, the temperature gradients, mean annual surface temperature, and in situ stress conditions are summarized for the three regions of the United States currently under consideration to host a crystalline repository. DOE

N85-29353# Earth Resource Associates, Athens, Ga.
SHALES AND OTHER ARGILLACEOUS STRATA IN THE UNITED STATES
Serge Gonzales and Kenneth S. Johnson (Oklahoma Univ., Norman) Mar. 1985 616 p refs
(Contract DE-AC05-84OR-21400)
(DE85-010453; ORNL/Sub-84-64794/1) Avail: NTIS HC A99/MF A01

Detailed geologic and hydrologic data are presented that describe shales and other argillaceous rocks; data are from the open literature. These data are intended to be used in the future to aid in assessment of various strata and their potential for repository siting. No observations, conclusions, or recommendations are made by the authors of this report relative to the suitability of various argillaceous rocks for waste disposal. There are, however, other published reports that contain technical data and evaluative statements regarding the suitability of various argillaceous rocks for repository siting. DOE

N85-29354# Battelle Memorial Inst., Argonne, Ill. Office of Crystalline Repository Development.
REGION-TO-AREA SCREENING METHODOLOGY FOR THE CRYSTALLINE REPOSITORY PROJECT
Apr. 1985 422 p refs
(Contract DE-AC02-83CH-10139)
(DE85-009892; DOE/CH-1) Avail: NTIS HC A18/MF A01

The Crystalline Repository Project's (CRP) process for region to area screening of exposed and near surface crystalline rock bodies in the three regions of the conterminous United States where crystalline rock is being evaluated as a potential host for the second nuclear waste repository (i.e., in the North Central, Northeastern, and Southeastern Regions) is discussed. How the U.S. Department of Energy's (DOE) General Guidelines for the Recommendations of Sites for Nuclear Waste Repositories (10 CFR 960) were used to select and apply factors and variables for the region to area screening are explained. Also explained is how these factors and variables are to be applied in the region to area screening, and indicate how this methodology relates to the

decision process leading to the selection of candidate areas. A brief general discussion of the screening process from the national survey through area screening and site recommendation is presented. This discussion sets the scene for detailed discussions which follow concerning the region to area screening process, the guidance provided by the DOE Siting Guidelines for establishing disqualifying factors and variables for screening, and application of the disqualifying factors and variables in the screening process. DOE

N85-29355# Nuclear Utility Services, Inc., Gaithersburg, Md.
SURFACE HYDROLOGIC CHARACTERISTICS OF PROPOSED REPOSITORY LOCATIONS IN THE PALO DURO BASIN OF THE TEXAS PANHANDLE
Apr. 1985 131 p refs Prepared for Battelle Memorial Inst., Columbus, Ohio
(Contract DE-AC02-83CH-10140)
(DE85-010530; BMI/ONWI-575) Avail: NTIS HC A07/MF A01

The surface hydrology in the two proposed locations of a high-level waste repository within the Palo Duro Basin of the Texas Panhandle are described. The following items are considered: (1) topography; (2) the major drainage systems - Palo Duro, Tierra Blanca, and Tule Creeks, and Prairie Dog Town Fork of the Red River; and (3) the most prominent impoundments, the playa lakes. The magnitude and frequency of precipitation throughout the region are discussed, and rainfall depth-duration-area data for the 100-year, 500-year, and probable maximum storms are presented. Soil properties are described, with specific reference to the infiltration and runoff processes and the contribution of these processes to Ogallala aquifer recharge. Information on historical streamflow, a brief description of flooding, and results of a study of floodplains for the 100-year, 500-year, and probable maximum storms are discussed. The water quality of these streams and an explanatation of the local geologic influences on stream-water chemistry are characterized. DOE

N85-29356# Sandia Labs., Albuquerque, N. Mex.
IMPLICATIONS ABOUT IN SITU STRESS AT YUCCA MOUNTAIN
S. J. Bauer, J. F. Holland (Technadyne), and D. K. Parrish (RE/SPEC, Inc.) 1985 9 p refs Presented at 26th US Symp. on Rock Mech., Rapid City, S. Dak., 26 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008068; SAND-84-2021C; CONF-850671-7) Avail: NTIS HC A02/MF A01

Volcanic tufts under Yucca Mountain on the Nevada Test Site (NTS) are being considered as potential media for geologic disposal of radioactive waste. Calculations in support of site evaluation, repository design, and performance assessment require accurate estimates of the in situ stresses and the variability in the stress state within Yucca Mountain. The regional geologic studies that pertain to the stress state of the NTS, stress measurements at Yucca Mountain, and stress measurements in nearby Rainier Mesa, in conjunction with finite element calculations were used to estimate the in situ stresses at Yucca Mountain. Based on these data, values of lateral earth stress coefficients (KO) in the range $0.3 < KO < 0.8$ are reasonable for repository depths in thermomechanical analyses. DOE

N85-29357# Western Research Inst., Laramie, Wyo.
DATA BASE OF ALL KNOWN, PUBLISHED DATA ON TRACE ELEMENTS IN OIL SHALE AND ITS PRODUCTS
M. George and L. Jackson Dec. 1984 27 p
(Contract DE-FC21-83FE-60177)
(DE85-003399; DOE/FE-60177/1792) Avail: NTIS HC A03/MF A01

A computerized bibliographic data base has been developed by Western Research Institute for storage and retrieval of literature references pertinent to trace elements in oil shale and its products. This data base is a Compendium of Oil Shale Trace Metals literature. It provides assistance for researchers in obtaining oil shale trace element literature references in their specific area of interest. Over 500 references were obtained and evaluated. Three hundred and seventy-five of these references were suitable for entry in the data base. Retrieval can be made by several specific data parameters. DOE

N85-29358# Department of Energy, Morgantown, W. Va. Unconventional Gas Projects Branch.
DEEP SOURCE GAS
Feb. 1985 26 p
(DE85-001984; DOE/METC-SP-215) Avail: NTIS HC A03/MF A01

Three separate emplacement concepts which could explain the occurrence of gas at extreme depths are presented: abiogenesis, subducted, organic-origin gas, and deep sedimentary basin gas. Deep source gas reseach focuses on the subducted, organic-origin concept to verify natural gas arising from depths in excess of 30,000 feet, to relate these occurrences to conceptual models, to define the limits of target areas, to quantify the resource, and to determine the significance of the gas to the nation's reserves. The research emphasizes an Earth science study of the Cordilleran Geologic Province of western North America. This area is prospective source largely because of known and suspected plate tectonic structures and their youthful emplacement, which increase the likelihood of a timely entrapment of deep-source generated hydrocarbons. It is indicated that the deep-source-gas generating capacity of the Aleutian Trench area of southern Alaska is high. It is shown that an apparent fossil subduction zone exists in western Washington. This zone appears to have very thick sedimentary rock units. Structural Observations made in the northern Brooks Range and central Alaskan Range indicate that overthrusting and compressional features may serve as large-scale target areas for deep source gas generation and occurrence. DOE

N85-29359# Sandia Labs., Albuquerque, N. Mex.
THERMAL-CYCLE TESTING OF THE G-TUNNEL HEATED BLOCK
Roger M. Zimmerman, Michael L. Wilson (Science Applications International Corp., Las Vegas, Nev.), Mark P. Board (Science Applications International Corp., Las Vegas, Nev.), and Robert L. Schuch 1985 14 p refs Presented at 26th US Symp. on Rock Mech., Rapid City, S.D., 26 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008408; SAND-84-1808C; CONF-850671-12) Avail: NTIS HC A02/MF A01

The measurements in the G-Tunnel heated block showed: The thermal expansion coefficient for constant stress temperature increases had a range of 5.0 to 8.7 x 0.0000001/C, and values compared well with a laboratory range of 6.4 to 8.0 x 0.0000001/C. Single fracture permeabilities were relatively insensitive to stress and slightly sensitive to temperature increases under representative in situ conditions. Excavation effects showed the most influences. The measurements ranged from 49 to 956 x 10 to the minus 9th power sq cm. Moisture contents varied from 55 to 70% saturation before heating to 15% after heating as measured with a neutron probe. There was a pronounced temperature dependence above 90 C. DOE

N85-29360# Morgantown Technology Center, W. Va. Unconventional Gas Projects Branch.
WESTERN GAS SANDS
Mar. 1985 19 p
(DE85-001985; DOE/METC-SP-217) Avail: NTIS HC A02/MF A01

Two broad research goals were defined: (1) reducing the uncertainty of the reservoir production potential, and (2) improving the extraction technology. These goals are being pursued by conducting research and encouraging industrial efforts in developing the necessary technology, including: (1) providing fundamental research into the nature of tight, lenticular gas sands and the technologies for diagnosing and developing them; (2) developing and verifying the technology for effective gas production; and (3) promoting the transfer of research products and technology advances to the gas industry in usable forms. Integrated geologic studies of three basins containing tight lenticular sands, which

were selected by DOE as priority research targets, were pursued as part of this new effort. The following conclusions were formed: Permeability of the tight gas sands can be as much as three to four orders of magnitude lower than that of conventional gas deposits; Nineteen western geologic basins and trends containing significant volumes of tight gas have been identified. Gas resources in the priority geologic basins have been estimated. Stimulation technology at the present time is insufficient to efficiently recover gas from lenticular tight reservoirs. DOE

N85-29361# Republic of Texas Coal Co., Houston.
COMMERCIAL FEASIBILITY OF UNDERGROUND GASIFICATION OF TEXAS LIGNITE TO PRODUCE SYNTHETIC GAS
T. C. Bartke, W. F. Tucker, R. S. Smith, and B. H. Glatzer Feb. 1985 72 p refs
(Contract DE-FG01-80RA-50380)
(DE85-001998; DOE/METC-85/2003) Avail: NTIS HC A04/MF A01

As part of the US Department of Energy's (DOE) Underground Coal Conversion (UCC) program, the Republic of Texas Coal Company conducted engineering, geologic, and financial studies to determine the commercial feasibility of developing deep basin Texas lignite. The lignite would be developed by in situ gasification to produce a synthesis gas consisting of hydrogen and carbon dioxide. The study was designed to analyze the four major factors that determine commercial feasibility of industrial processes: (1) market potential, (2) finance, (3) site selection and characterization, and (4) process and facility design engineering. The results indicated that such a facility was both technically and economically feasible if appropriate financing could be found. A preferred site meeting the geologic, technical, and environmental parameters for an efficient in situ gasification facility was selected in east Texas in Panola County, 5 miles west of Carthage, Texas. DOE

N85-29362# Sandia Labs., Albuquerque, N. Mex.
MEASUREMENT AND CALCULATION OF THE MECHANICAL RESPONSE OF A HIGHLY FRACTURED ROCK
S. J. Bauer, R. K. Thomas, and L. M. Ford 1985 8 p refs Presented at the 26th US Symp. on Rock Mech., Rapid City, S.D., 26 Jun. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008421; SAND-84-2020C; CONF-850671-13) Avail: NTIS HC A02/MF A01

Attempts were made to validate a material constitutive model for a jointed rock mass. The continuum model, as utilized here within a finite element code, consists of a material constitutive descrption based on the linear elastic behavior of the matrix material and nonlinear normal and shear behavior of fracture planes. The validation exercise consists of: (1) characterizing an appropriate physical model, (2) measuring the mechanical response of that physical model, and (3) using the physical model characteristics to calculate the mechanical response of the physical model. Calculated and measured responses for small-scale physical models (thermally-fractured granite) are in qualitative agreement. For deviatoric loadings, the calculated tangent modulus is an order of magnitude less than that of the matrix and exhibits stiffening with increasing a load, and thereby functionally tracks the measured response. DOE

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N85-29363*# Cleveland State Univ., Ohio.
CONCEPTUAL DESIGN OF A FIXED-PITCH WIND TURBINE GENERATOR SYSTEM RATED AT 400 KILOWATTS Final Report
Adam Pintz, R. Kasuba, and J. Spring Jun. 1984 86 p refs Sponsored in part by DOE
(Contracts NCC3-6; DE-AI01-79ET-20320)
(NASA-CR-174877; NAS 1.26:174877; DOE/NASA/0006-1) Avail: NTIS HC A05/MF A01 CSCL 10B

The design and cost aspects of a fixed pitch, 400 kW Wind Turbine Generator (WTG) concept are presented. Improvements in reliability and cost reductions were achieved with fixed pitch operation and by incorporating recent advances in WTG technology. The specifications for this WTG concept were as follows: (1) A fixed pitch, continuous wooden rotor was to be provided by the Gougeon Bros. Co. (2) An 8 leg hyperboloid tower that showed promise as a low cost structure was to be used. (3) Only commercially available components and parts that could be easily fabricated were to be considered. (4) Design features deemed desirable based on recent NASA research efforts were to be incorporated. Detailed costs and weight estimates were prepared for the second machine and a wind farm of 12 WTG's. The calculated cost of energy for the fixed pitch, twelve unit windfarm is 11.5 cents/kW hr not including the cost of land and access roads. The study shows feasibility of fixed pitch, intermediate power WTG operation. Author

N85-29364*# Toledo Univ., Ohio.
WAKE EFFECTS ON THE AERODYNAMIC PERFORMANCE OF HORIZONTAL AXIS WIND TURBINES
Abdollah A. Afjeh Aug. 1984 176 p refs
(Grant NCC3-5; Contract DE-AI01-76ET-20320)
(NASA-CR-174920; DOE/NASA/0005-1; NAS 1.26:174920) Avail: NTIS HC A09/MF A01 CSCL 10A

Success of vortex theories in the performance analysis of horizontal axis wind turbines depends greatly upon accurate specification of the geometry of the vortex wake. Two analysis methods were developed, a new simplified free wake method (SFW) and a prescribed wake method. An earlier wake model of helicopter rotors is extended for wind turbine applications, the fast free wake method (FFW). The FFW was accomplished by partitioning the flow field downstream of the rotor into three regions: (1) the near wake, modeled as a series of straight vortex lines; (2) the intermediate wake, modeled as a number of vortex rings; and (3) the far wake, taken to be a semi-infinite cylindrical wake. In the SFW, a new wake model is proposed. The model assumes that the wake is composed of an intense tip vortex and a diffused inboard wake, consistent with the experimentally observed wake of hovering helicopters. It is assumed that the vortex formation was almost immediate as opposed to the actual gradual rolling-up of the tip vortex. The method is demonstrated by assuming that the wake expansion can be represented by an analytical expression. E.A.K.

N85-29365*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GOVERNMENT REVIEW OF THE MOD-2 WIND TURBINE (AS-BUILT)
William R. Johnson, Arthur G. Birchenough, Bradford S. Linscott, John R. Reagan, Paul J. Sirocky, Raymond L. Sizemore, Timothy L. Sullivan, and Ronald H. Holeman Jun. 1985 76 p refs Prepared in cooperation with Bonneville Power Administration
(Contract DE-AI01-76ET-20320)
(NASA-TM-86983; E-2526; DOE/NASA/20320-63; NAS 1.15:86983) Avail: NTIS HC A05/MF A01 CSCL 10B

The findings and recommendations of the Government committee formed to conduct an as-built review of the three Mod-2 wind turbine units at Goldendale, Washington are given. The purpose of the review was to identify any critical deficiencies in machine components that could result in failure, and to recommend any necessary corrective action before resuming safe machine operation. The review concluded that one of the deficiencies

identified would preclude planned attended or unattended operation, provided that certain corrective actions were implemented.
R.J.F.

N85-29366# Los Alamos Scientific Lab., N. Mex.
SOLAR POND RESEARCH AT THE LOS ALAMOS NATIONAL LABORATORY
G. F. Jones, K. A. Meyer, J. C. Hedstrom, and D. P. Grimmer (New Mexico Solar Energy Inst., Las Cruces) 1984 55 p refs
(Contract W-7405-eng-36)
(DE85-008631; LA-UR-84-3541) Avail: NTIS HC A04/MF A01

A description of solar pond research at Los Alamos National Laboratory is presented. The main issues in the theory of solar ponds are discussed. Among these are the interfacial-boundary-layer model, models for interface motion and pond performance, heat extraction, and ground heat loss. The core of the research effort at Los Alamos was the development of a one-dimensional computer program to accurately predict dynamic performance of a solar pond. The computer model and the experiments that were designed and performed to validate it are described. The experiments include two laboratory tanks wherein temperature, salinity, and flow visualization data were obtained and a 232 m(2) outdoor solar pond. Results from preliminary validation show good agreement between the pond's predicted dynamic behavior and that which actually occurred in the experiments. More validation using data from full-sized solar ponds is needed. A new correlation for the ratio of interfacial salt-flux to heat-flux is proposed which agrees well with our data. Recommendations for future research are given. DOE

N85-29367# Los Alamos Scientific Lab., N. Mex.
ABSORBER COATINGS DEGRADATION
S. W. Moore 1984 11 p refs Presented at the Renewable Energy Technol. Symp. and Intern. Exposition, Anaheim, Calif., 4-5 Jun. 1984
(Contract W-7405-eng-36)
(DE85-008628; LA-UR-84-1745) Avail: NTIS HC A02/MF A01

Active heating and cooling materials reliability, maintainability, and exposure testing program are analyzed. Major limitations to the use of solar energy are the uncertain reliability and lifetimes of solar systems. The program is aimed at determining material operating limitatings, durabilities, and failure modes such that materials improvements can be made and lifetimes can be extended. Absorber coatings and degradation of these coatings are examined. DOE

N85-29368# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SERI PHOTOVOLTAIC ADVANCED RESEARCH AND DEVELOPMENT PROJECT: FY 1984 ACCOMPLISHMENTS
Mar. 1985 109 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002939; SERI/SP-216-2628) Avail: NTIS HC A06/MF A01

Photovoltaics research and development and a bibliography of technical publications are summarized and several management highlights are included. Single function thin films, high efficiency multijunction concepts, innovative concepts, silicon materials, flat plate collectors, and system experiments are reported. Subcontract program categories are amorphous thin films, high efficiency concepts, polycrystalline thin films, crystalline silicon, and innovative concepts subdivided into new ideas and photoelectrochemical cells. The PV devices and measurements, solid state research, insolution resource assessment, advanced PV systems research, and solar electric research activities are included. The bibliography is a compilation of the technical publications resulting from all SERI research during FY 1983 and FY 1984. The entries are presented alphabetically by author. DOE

N85-29369# Boeing Aerospace Co., Seattle, Wash. Energy Systems.
SMALL CENTRAL RECEIVER BRAYTON CYCLE STUDY Final Technical Report, 1 Dec. 1982 - 30 Jun. 1983
Jan. 1985 271 p refs
(Contract DE-AC04-76DR-00789)
(DE85-008882; SAND-84-8185) Avail: NTIS HC A12/MF A01

The potential of small scale, central receiver Brayton cycle systems to provide simple, highly reliable, low-maintenance electrical generating systems was investigated. The objectives were to identify Brayton cycle configurations suited for high-reliability central receiver systems generating electricity in the 2- and 25-MW/sub e/ power ranges and to identify and recommend high-temperature receiver designs most appropriate to the preferred cycle configurations. The cycle configurations considered were open and closed cycles with and without regeneration and/or intercooling. The configurations were assessed in terms of required machine design modifications, component availability turbomachinery location, costs and performance. Design point performance was studied as a function of system pressure, turbine inlet temperature and receiver pressure loss. An open cycle regenerated and intercooled configuration was selected for the 25-MW/sub e/ plant size. At the 2-MW/sub e/ size, an open simple cycle was chosen. DOE

N85-29370# Arizona Public Service Co., Phoenix.
AIRPORT SOLAR PHOTOVOLTAIC CONCENTRATOR PHASE 3 Project Status Report, 1 Oct. - 31 Dec. 1984
1985 8 p
(Contract DE-AC04-80ET-20624)
(DE85-006773; ASPCP-3-11; DOE/ET-20624/T11) Avail: NTIS HC A02/MF A01

The objective was to operate and evaluate for three years a photovoltaic system installed at an airport. The system consists of an 80-array subsystem with a nominal rating of 225 peak kilowatts dc output at the array field. Installation of a new inverter is reported. A fire was caused by an electrical short to ground inside one of the solar cell modules and began spreading throughout one of the arrays, causing extensive damage. Fuses were installed in series with the blocking diodes to prevent high reverse currents. DOE

N85-29371# Department of Energy, Morgantown, W. Va.
FUEL CELLS: A BIBLIOGRAPHY
W. H. Kinser, ed. Apr. 1985 436 p
(DE85-004565; DOE/METC-85/15; DOE/TIC-3359-Suppl-2) Avail: NTIS HC $23.00 (special price)/MF A01

Included are approximately 1900 citations of foreign and domestic reports, journal articles, patents, conference papers and proceedings, monographs, and books. The citations were taken from the DOE Energy Data Base covering the period July 1980 through February 1985. The citations are arranged in subject categories as shown in the table of contents. Within each category the report citations are arranged alphanumerically by report number, and nonreport literature citations are arranged in reverse chronological order. Corporate Author, Personal Author, Subject, Contract Number, and Report Number indexes are provided. DOE

N85-29372# Sandia Labs., Albuquerque, N. Mex.
PROGRESS IN SOLAR THERMAL DISTRIBUTED RECEIVER TECHNOLOGY
J. A. Leonard and J. V. Otts 1985 10 p refs Presented at the 12th Ann. Energy Technol. Conf. and Exposition, Washington, D.C., 25 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-008066; SAND-85-0290C; CONF-850301-1) Avail: NTIS HC A02/MF A01

A brief discussion is given on the fundamentals of parabolic dish collectors. Private and Department of Energy supported projects which employ parabolic dish collector systems are described. These projects include: the Distribution Receiver Test Facility, Shenandoah Solar Total Energy Project, Vangurd I, Solar Plant No. 1, the Dish/Stirling Solar Electric Generating System, the Organic Rankine Cycle, and the Solarized Automotive Gas Turbine. DOE

N85-29373# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

POST-DEPOSITION HEAT TREATMENTS OF CdS/CuInSe2 SOLAR CELLS

K. Zweibel Mar. 1985 25 p refs

(Contract DE-AC02-83CH-10093)

(DE85-002943; SERI/PR-211-2468) Avail: NTIS HC A02/MF A01

CdS/CuInSe2 thin film solar cells are being fabricated at or above 10% efficiency at several companies. In each case, there is a similar air or oxygen heat treatment performed after the cell deposition is completed, raising efficiency significantly. Performance alterations vary, but post annealed cells are often improved by over 100% in efficiency. Although no optimized CdS/CuInSe2 cell is made without an anneal, the anneal has been poorly understood in terms of the actual physical chemical changes it produces. The anneal is described. Greater knowledge of the anneal's character should help researchers to understand and to improve the CdS/CuInSe2 cell. DOE

N85-29374# Grande (Peter C.), Phoenixville, Pa.

FOAMGLASS SOLAR WINDOW COLLECTOR Final Report

Peter C. Grande [1985] 15 p

(Contract DE-FG43-79R3-06074)

(DE85-009197; DOE/R3-06074/T1) Avail: NTIS HC A02/MF A01

Solar heating of a living area by means of a foamglass window collector is reported. The collector was built with readily available materials available at most local hardware stores. The payback period was found to be 3.7 years, slightly longer than anticipated. DOE

N85-29375# Midwest Research Inst., Golden, Colo.

HIGH TEMPERATURE SENSIBLE HEAT STORAGE OPTIONS

K. Y. Wang, F. Kreith, R. E. West, and P. Lynn Nov. 1984 9 p refs Presented at the Solar Energy 1985 ASME/ASES Conf., Knoxville, Tenn., 25-29 Mar. 1985 Prepared in cooperation with Colorado Univ., Boulder and Lynn (P. P.), Inc., Boulder, Colo.

(Contract DE-AC01-83CH-10093)

(DE85-000534; SERI/TP-252-2569; CONF-850306-2) Avail: NTIS HC A02/MF A01

Design options and operation criteria for sensible heat molten salt storage with internal insulation are presented. Raft thermocline, two-tank, and two-media thermocline systems are the concepts discussed. Regenerative cooling, bottom insulation, and thermocline stability are considered in the thermal analysis. A brief discussion of the technical risks of each tank system is included. Cost estimations are also provided. DOE

N85-29376# Sandia Labs., Albuquerque, N. Mex.

LIQUID METAL THERMOELECTRIC CONVERTER (LMTEC) FOR SOLAR APPLICATIONS

J. I. Martinez 1985 10 p refs Presented at the Solar Thermal Res. Program Ann. Conf., Denver, 20 Feb. 1985

(Contract DE-AC04-76DP-00789)

(DE85-008405; SAND-84-06270; CONF-850252-3) Avail: NTIS HC A02/MF A01

The research and development plan for the liquid metal thermoelectric converter (LMTEC) is reviewed. A current technology in thermoelectric converters including thermally regenerative electrochemical systems (TRES), fuel cells, thermionic devices, magnetohydrodynamics, and other modes of direct thermal-to-electric conversion were reviewed. The principal objective is to design, engineer, and develop a LMTEC suitable for use in solar distributed receiver applications. Since the thermal requirements for the LMTEC are in the temperature range of parabolic dishes, the engineering development effort concentrates on a device that can be mounted at the focal point of a dish and preferably incorporated into the receiver. The LMTEC most likely will be based on the current sodium heat engine (SHE) concept. The concept for solar applications and conducting the necessary engineering development to produce a 20 to 50 kWe device is optimized. DOE

N85-29377# Sandia I.abs., Albuquerque, N. Mex.

MECHANICALLY-STACKED MULTIJUNCTION SOLAR CELLS

J. M. Gee 1985 15 p refs Presented at the 6th European Photovoltaic Solar Energy Conf. and Exhibtion, London, 15 Apr. 1985

(Contract DE-AC04-76DP-00789)

(DE85-010389; SAND-85-0946C; CONF-850408-3) Avail: NTIS HC A02/MF A01

The results of experiments to simulate the performance of mechanically stacked, multijunction solar cells are reported. The simulation consisted of stacking an AlGaAs optical filter on top of a silicon cell and measuring the silicon cell's output. Analysis of the experimental results was able to quantify the various mechanisms (absorption and reflection) that resulted in the loss of silicon cell output. Calculations were also performed to compare the relative merits of two different types of silicon cells and an InGaAs cell for stacked cell applications. DOE

N85-29378# Ohio State Univ., Columbus. Fontana Corrosion Center.

ELECTROCHEMICAL AND MORPHOLOGICAL STUDY OF THE EFFECT OF TEMPERATURE ON THE RESTRUCTURING AND LOSS OF CAPACITY OF ALKALINE BATTERY ELECTRODES Final Report

Digby D. Macdonald, Bruce G. Pound, and Stephen J. Lenhart Nov. 1984 130 p refs Prepared for California Univ. Berkeley. Lawrence Berkeley Lab.

(Contracts DE-AC03-76SF-00098; LBL-4506610)

(DE85-006869; LBL-18716) Avail: NTIS HC A07/MF A01

The degradation processes occurring within porous nickel battery electrodes were investigated during charge/discharge cycling at temperatures in the range 0 to 100(0) C. The ac impedance of two types of porous nickel electrodes (sintered electrodes and rolled and bonded electrodes) in a 8 m KOH solution was measured, and the data were analyzed in terms of a transmission line model (TLM). Parameters in the TLM were curve fitted to experimental impedance data obtained for porous electrodes at different stages of cycling. Changes in these parameters with cycling time for rolled and bonded electrodes were consistent with experimental observations, and could be attributed to various degradation processes. The principal changes found to occur with increasing cycle number were that the average pore effective length decreases and the average solid phase resistivity increases. The impedance data for sintered electrodes do not change during galvanostatic cycling and failures occur abruptly after a relatively large number of cycles. Consequently, the TLM provides little insight into cycle dependent degradation phenomena on sintered electrodes. DOE

N85-29379# Sandia Labs., Albuquerque, N. Mex.

PHOTOVOLTAIC SYSTEMS DEVELOPMENT PROJECT: AN ACTIVITY SUMMARY

Harold N. Post, Gary J. Jones, Thomas S. Key, and John W. Stevens Jan. 1985 22 p refs

(Contract DE-AC04-76DP-00789)

(DE85-009994; SAND-84-1755) Avail: NTIS HC A02/MF A01

The Photovoltaic Systems Development Project has as its principal goal the development of optimum system configurations for all photovoltaic applications. A summary of past findings and current activities within the Systems Development Project and system issues which remain to be addressed are presented. Key results developed through previous activities are identified, including references for the reader interested in additional detail. This presentation uses theformat of the Photovoltaic Five Year Research Plan to show the relatiohship between the activities of this project and the other activities in the National Photovoltaic Program. Project plans and corresponding program impacts are preseneted and a major new activity, that of the System Design Assistance Center, is identified. It is anticipated that this activity, which will provide photovoltaic technology transfer to a variety of interested users/owners in the public, private and governmental sectors, will take on considerably more importance in the years to come. DOE

N85-29380# Los Alamos Scientific Lab., N. Mex.
SALT-GRADIENT SOLAR PONDS
Donald A. Neeper 1984 8 p Presented at Lecture Series, People's Republic of China, 25 Aug. - 15 Sep. 1984
(Contract W-7405-eng-36)
(DE85-008626; LA-UR-84-2423) Avail: NTIS HC A02/MF A01

A description of salt-gradient solar ponds is presented. Guidelines concerning the construction and maintenance of the pond are discussed. A computer model was used to study layer migration in laboratory tanks and in an outdoor pond. The status of solar ponds is briefly discussed. An equation relating heat flux and salt flux at a boundary is included. DOE

N85-29381# Pacific Northwest Lab., Richland, Wash.
FEASIBILITY OF MELT CASTING STRONTIUM FLUORIDE TO PRODUCE HIGH-DENSITY HEAT SOURCES
E. J. Wheelwright and D. R. Montgomery Feb. 1985 5 p Presented at Waste Management '85, Tucson, Ariz., 24-28 Mar. 1985
(Contract DE-AC06-76RL-01830)
(DE85-009429; PNL-SA-12637; CONF-850314-36) Avail: NTIS HC A02/MF A01

Melt casting as a process for compacting SrF2 to near theoretical density was investigated. A nonradioactive SrF2 mixture, similar in chemical composition and method of preparation to SrF2 encapsulated at the Hanford waste encapsulation and storage facility (WESF) was used for the test evaluations. Hard, dimensionally stable, monolithic ingots that are > 98% of theoretical density were produced. Significant chemical purification from Al, Fe, Cr, Ni, Na and Zr is demonstrated. DOE

N85-29382# Federal Aviation Administration, Washington, D.C. Demonstration Projects Div.
SOLAR ENERGY FOR HIGHWAY USES Final Report
Aug. 1984 47 p
(Contract DE-AI01-78CS-35167)
(DE84-015653; FHWA-DP-52-2) Avail: NTIS HC A03/MF A01

Under this effort fifteen solar energy heating systems were installed as demonstration projects by various state transportation agencies. These projects were intended to demonstrate to the owning agency and other transportation agencies that solar heating can indeed be a viable and appropriate alternative for their facilities. The intent is that through the exposure and experience gained, the states would adopt solar heating as a standard option for their other facilities. DOE

N85-29383# Los Alamos Scientific Lab., N. Mex.
ESTABLISHMENT OF A METHODOLOGY FOR PREDICTING LIFETIMES IN ACTIVE SOLAR SYSTEMS Progress Report
John G. Avery 1984 34 p Presented at the Solar Energy Res. Program Rev. Meeting, Golden, Colo., Spring, 1984 Submitted for publication
(Contract W-7405-eng-36)
(DE85-008629; LA-UR-84-1680) Avail: NTIS HC A03/MF A01

Real-time field site and accelerated laboratory data have been generated for five commercially signficant metal/fluid combinations found in active solar systems. DOE

N85-29384# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SILVERED POLYMER REFLECTORS
Paul Schissel, H. H. Neidlinger, and A. W. Czanderna Mar. 1985 12 p refs Presented at the Ann. Solar Thermal Res. Conf., Denver, 20-22 Feb. 1985
(Contract DE-AC02-83CH-10093)
(DE85-008782; SERI/TP-255-2670; CONF-850252-4) Avail: NTIS HC A02/MF A01

One of the principal objectives of the Solar Thermal Research Program is to develop silvered polymer films for constructing durable, low-cost, lightweight concentrating collectors for high temperature solar thermal systems. The mirrors are characterized for their solar-weighted (air mass 1.5) reflectance and exposed to environmental degradation. Photodegradation of polymers has also been studied using Fourier transform infrared spectroscopy supplemented with surface analysis characterization. Results are discussed for extruded films, ultraviolet effects, metallization, and the effects of polymer additives. DOE

N85-29385# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SERI SOLAR ENERGY STORAGE PROGRAM: FY 1984 Annual Report
Werner Luft, Mark Bohn, Robert J. Copeland, Frank Kreith, and R. Gerald Nix Feb. 1985 43 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002936; SERI/TR-231-2593) Avail: NTIS HC A03/MF A01

The activities of the Solar Energy Research Institute's Solar Energy Research Institute's Solar Energy Storage Program during its sixth year are summarized. During FY 1984 a study was conducted to identify the most promising high-temperature containment concepts considering corrosion resistance, material strength at high temperature, reliability of performance, and cost. Of the two generic types of high-temperature thermal storage concepts, the single-tank system was selected using a two-medium approach to the thermocline maintenance. This concept promises low costs, but further research is required. A conceptual design for a sand-to-air direct-contact heat exchanger was developed using dual-lock hoppers to introduce the sand into the fluidized-bed exchanger, and using cyclones to remove sand particles from the output air stream. Preliminary cost estimates indicate heat exchanger subsystem annual levelized costs of about $4/GJ with compressor costs of an additional $0.75/GJ. An economic analysis comparing sensible and latent heat storage for nitrate and carbonate salts with solely sensible heat storage showed 3%-21% cost savings with combined sensible and latent heat storage. DOE

N85-29386# Institute of Gas Technology, Chicago, Ill.
EFFECTS OF H2S ON MOLTEN CARBONATE FUEL CELLS Progress Report, 1 Apr. - 30 Jun. 1984
Robert J. Remick Mar. 1985 87 p refs
(Contract DE-AC21-83MC-20212)
(DE85-008310; DOE/MC-20212/1739) Avail: NTIS HC A05/MF A01

This report summarizes work accomplished to identify the poisoning mechanism(s) responsible for performance losses of molten carbonate fuel cells (MCFC) when operating on sulfur-containing gases. This objective is being addressed by focusing out-of-cell and in-cell experiments on single mechanistic issues, followed by incorporation of the results into a model that correlates cell potential decline to contaminant(s) concentration. When coupled with gas cleanup cost projections, the model can be used to conduct trade-off studies leading to the selection of optimum feed-gas compositions for MCFC power plants. The importance of this program is that the degree to which H2S and other contaminants must be removed from typical MCFC fuels can have a profound effect on the cost of cleaning the fuel gas, especially if contaminant levels lower than 0.1 ppM are required. The anticipated product from the overall program is a justifiable specification for gas cleanup requirements for MCFC power plants. The loss in performance experienced by fuel cells operating on contaminated fuels has been traced to the electrochemical formation of a layer of nickel sulfide on the fuel cell electrode. DOE

N85-29387# Boeing Engineering and Construction Co., Seattle, Wash. Solar Systems Group.
PLASTIC HELIOSTAT ENCLOSURE ANALYSIS Final Report
M. J. Berry Dec. 1984 187 p refs
(Contract DE-AC04-76DR-00789)
(DE85-009112; SAND-81-8188) Avail: NTIS HC A09/MF A01

The conceptual design and cost analysis of an enclosed plastic heliostat for a 50-MW/sub e/ central receiver solar thermal electric power plant are presented. The purpose of the study was to analyze the most recent design of the Boeing enclosed plastic heliostat for cost and compare results with a reference second generation glass heliostat case provided by Sandia National

Laboratories, Livermore. In addition, sensitivities of busbar energy costs to variations in capital cost (installed cost), operation and maintenance most and overall reflectivity were evaluated. DOE

N85-29388# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
SOLAR THERMAL RESEARCH PROGRAM
B. P. Gupta, M. Carasso, and R. G. Nix Mar. 1985 12 p Presented at 12 Ann. Technol. Conf. Exposition, Washington, D.C., 25 Mar. 1985
(Contract DE-AC02-83CH-10093)
(DE85-000514; SERI/TP-251-2671; CONF-850301-4) Avail: NTIS HC A02/MF A01

The principal objective of the Solar Thermal Research Program is to conduct research leading to assessments of the feasibility of new concepts that can be cost competitive over the entire temperature range. Research opportunities are identified by determining cost and performance targets and by conducting exploratory research on innovative concepts that use concentrated solar flux. The program conduct basic and applied research in materials, thermal sciences, chemical sciences, and engineering analysis needed to provide the knowledge base for new technology. Collector technology research includes optical materials, concentrators, and receivers. Research is also aimed at efficient conversion of concentrated solar flux into electricity and direct photo/thermochemical conversion. Activity is directed at the generation and characterization of innovative concepts and applications. DOE

N85-29389# Argonne National Lab., Ill. Chemical Technology Div.
LITHIUM-ALLOY/IRON SULFIDE BATTERY DESIGN STUDIES
A. A. Chilenskas 23 Oct. 1984 11 p Presented at Elec. Vehicle Contractors' Coordination Meeting, Las Vegas, Nev., 23 Oct. 1984
(Contract W-31-109-eng-38)
(DE85-007991; CONF-841073-1) Avail: NTIS HC A02/MF A01

The DOE/EHV sponsored design studies carried out at Argonne and the integration of these studies with the EPRI program for the development of an advanced van battery are discussed. The design basis for the van battery is given. Some of the inputs are given which are required to derive the battery specifications. Modeling work to optimize the powr/energy ratio as a function of energy was performed. Energy efficiency of the battery is addressed, as is battery deprication. Recharging and reliability of the battery is discussed. DOE

N85-29390# Sandia Labs., Albuquerque, N. Mex. Solar Central Receiver Systems.
10 MWe SOLAR THERMAL CENTRAL RECEIVER PILOT PLANT TOTAL CAPITOL COSTS
H. F. Norris, Jr. Feb. 1985 188 p refs
(Contract DE-AC04-76DR-00789)
(DE85-009113; SAND-83-8019) Avail: NTIS HC A09/MF A01

A detailed breakdown of the capital cost of the 10 MWe Solar Thermal Central Receiver Pilot Plant located near Barstow, California is presented. The total capital requirements of the pilot plant are given in four cost breakdown structures: (1) project costs (research and development, design, factory, construction, and start up); (2) plant system costs (land, structures and improvements, collector system, receiver system, thermal transport system, thermal storage system, turbine generator plant system, electrical plant system, miscellaneous plant equipment, and plant level); (3) elements of work costs (sitework/earthwork, concrete work, metal work, architectural work. process equipment, piping and electrical work); and (4) recurring and nonrecurring costs. For all four structures, the total capital cost is the same; however, the allocation of costs within each structure is different. These cost breakdown structures were correlated to show the interaction and the assignment of costs for specific areas. DOE

N85-29391# Department of Energy, Washington, D. C. Div. of Energy Storage.
ELECTROCHEMICAL ENERGY STORAGE BRANCH Annual Progress Report, 1 Oct. 1983 - 30 Sep. 1984
Jan. 1985 34 p refs
(DE85-007592; DOE/CE-0121) Avail: NTIS HC A03/MF A01

The activities of the Electrochemical Energy Storage Branch are highlighted, including the Technology Base Research and the Exploratory Technology Development and Testing projects within the Electrochemical Energy Storage Program for the 1984 fiscal year. General Headquarters activities are presented first; and then, a summary of the Director Controlled Milestones, followed by other major accomplishments. A listing of the workshops and seminars held during the year is also included. DOE

N85-29392# Rockwell International Science Center, Thousand Oaks, Calif.
RESEARCH ON ELECTROCHEMICAL PHOTOVOLTAIC CELLS Final Report, 1 Jul. 1982 - 30 Apr. 1983
D. Tench Golden, Colo. Midwest Research Inst. Mar. 1985 76 p refs Prepared for Midwest Research Inst., Golden, Colo.
(Contract DE-AC02-83CH-10093)
(DE85-008775; SERI/STR-211-2556) Avail: NTIS HC A05/MF A01

This report contains results of research conducted to provide a basis for designing a practical electrochemical solar cell based on the 2-6 compound semiconductors. Emphasis was on developing new solvent/redox systems and conducting films that will stabilize the 2-6 compounds against photodissolution without seriously degrading the long term solar response and on applying electrochemical photocapacitance spectroscopy (EPS) to the development of improved thin film materials. In photoelectrode stabilization, work focused on electrodeposited polypyrrole to determine the effects of the deposition parameters on the film density and electrical conductivity. These film properties were found to vary dramatically with the substrate, deposition conditions, electrolyte and anion employed, indicating there is considerable leeway for improvement. The most dense and highly conductive films have involved polymeric anions, nonaqueous solvents, and metallic substrates. A promising approach to providing an improved surface for polymer deposition on semiconductors has been identified. In the EPS area, the focus was on the development of thin film CdSe materials. DOE

N85-29393# EG and G Washington Analytical Services Center, Inc., Morgantown, W. Va.
F-CELL: THE ASPEN FUEL CELL MODEL
P. A. Regenhardt Mar. 1985 235 p refs
(Contract DE-AC21-81MC-14521)
(DE85-001975; DOE/METC-85/10) Avail: NTIS HC A11/MF A01

This report documents the fuel cell model created at the Morgantown Energy Technology Center for systems simulations that use the Advanced System for Process Engineering (ASPEN) simulator. The report includes: (1) an explanation of the thermodynamics involved, (2) an explanation of the efficiencies used to describe and compare a fuel cell, (3) the FORTRAN code and ASPEN system definition file entries required to install the model into the ASPEN system, (4) three sample ASPEN input files demonstrating how the model could be used for phosphoric acid, molten carbonate, and solid oxide fuel cells, (5) a detailed ASPEN input file that simulates a commercial 40-kW phosphoric acid fuel cell system, and (6) the technical and the user entries for the ASPEN manuals. F-CELL is designed to use the results of either a mechanistic model or experimental data to model a fuel cell in a system study. A double set of efficiencies is produced; the first is calculated from the user's input, and the second is based on ASPEN's results. The second set of efficiencies serves as a check on the input data and is not used in any internal calculations. The model also checks for carbon deposition. DOE

N85-29394# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
DEVELOPMENT OF MOLTEN CARBONATE FUEL CELL POWER PLANT, VOLUME 1 Final Report, Nov. 1979 - May 1984
Mar. 1985 745 p refs

(Contract DE-AC02-80ET-17019)
(DE85-008743; DOE/ET-17019/20-Vol-1) Avail: NTIS HC A99/MF E03

The technical results of a molten carbonate fuel cell power plant evelopment program are presented which establish the necessary technology base and demonstrate readiness to proceed with the fabrication and test of full size prototype stacks for coal fueled molten carbonate fuel cell power plants. The effort covered power plant systems studies, fuel cell component technology development, fuel cell stack design and analysis, manufacturing process definition, and an extensive experimental program. The reported results include: the definition and projected costs for a reference coal fueled power plant system based on user requirements, state-of-the-art advances in anode and electrolyte matrix technology, the detailed description of an internally manifolded stack design concept offering a number of attractive advantages, and the specification of the fabrication processes and methods necessary to produce and assemble this design. Results from the experimental program are documented. DOE

N85-29395# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
MATERIALS RESEARCH FOR PASSIVE SOLAR SYSTEMS: SOLID-STATE PHASE-CHANGE MATERIALS
D. K. Benson, J. D. Webb, R. W. Burrows, J. D. O. McFadden, and C. Christensen Mar. 1985 56 p refs
(Contracts DE-AC02-83CH-10093; EG-77-C-01-4042)
(DE85-008779; SERI/TR-255-1828) Avail: NTIS HC A04/MF A01

A set of solid-state phase-change materials is being evaluated for possible use in passive solar thermal energy storage systems. The most promising materials are organic solid solutions of pentaerythritol (C5H12O4), pentaglycerinve (C5H12O3), and neopentyl glycol (C5H12O2). Solid solution mixtures of these compounds can be tailored so that they exhibit solid-to-solid phase transformations at any desired temperature between 25 C and 188 C, and have latent heats of transformation etween 20 and 70 cal/g. Transformation temperatures, specific heats, and latent heats of transformation have been measured for a number of these materials. Limited cyclic experiments suggest that the solid solutions are stable. These phase-change materials exhibit large amounts of undercooling; however, the addition of certain nucleating agents as particulate dispersions in the solid phase-change material greatly reduces this effect. Computer simulations suggest that the use of an optimized solid-state phase-change material in a Trombe wall could provide better performance than a concrete Trombe wall four times thicker and nine times heavier. DOE

N85-29396# Fuhse Energie System G.m.b.H., Oldenburg (West Germany).
INVESTIGATION OF THE TRANSFERABILITY OF MEASURES OF PASSIVE SOLAR ENERGY UTILIZATION IN THE USA TO THE FEDERAL REPUBLIC OF GERMANY Final Report, Mar. 1983
Wilmar Fuhse and Annegret Fuhse Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 191 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-284; ISSN-0340-7608) Avail: NTIS HC A09/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 35.50

The transferability of passive solar measures in the USA to the FRG was investigated in order to contribute to the further development of solar architecture. The investigations show that passive solar means offer a contribution to the reduction of the national energy consumption. Thanks to the high building standards the starting conditions are even better than in the USA. The approval of passive solar building does not represent difficulties (exception: buildings for living below ground level are not allowed in the FRG). The investigations show that passive solar buildings should be adjusted carefully to the local meteorological conditions, and that the energy saving potential depends essentially on the operation of passive solar buildings. Without night insulation, passive solar means can only be conditionally economical.
Author (ESA)

N85-29397# Idaho Univ., Moscow. Dept. of Chemistry.
IMPROVED ACID ELECTROLYTES FOR FUEL CELLS Annual Report, Jan. - Oct. 1984
Jeanne M. Shreeve Nov. 1984 62 p refs
(PB85-176053; GRI-84/0239) Avail: NTIS HC A04/MF A01 CSCL 10B

Several of the following compounds were tested: (CF3)2P(O)OH, CF3P(O)(OH)2, C6F5SO3H and SE5CHFSO3H. New compounds which have been synthesized and await testing are CF3CH2OP(O)(OH)2, (CF3CH2O)2P(O)OH, and (HO)2P(O))CH2(CF2)xCH2OP(O)(OH)2 (x = 2,4). Work on inorganic chemistry and complete electrochemical evaluation is in progress. GRA

N85-29398# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mechanical Engineering.
THERMAL PERFORMANCE TESTING AND MATHEMATICALLY MODELING OF INTEGRAL COLLECTOR STORAGE SOLAR HOT WATER SYSTEMS Final Report
W. C. Thomas Feb. 1985 234 p refs Sponsored in part by DOE
(Grant NB82-NADA-3018)
(PB85-186906; VPI-E-85-5; NBS/GCR-85-490) Avail: NTIS HC A11/MF A01 CSCL 13M

The concept behind the alternative testing method is to characterize the thermal performance of the solar collection elements in the integral system using standard test methods for conventional solar collectors. After measuring the efficiency and incident angle response, the integral collector storage hot water system would be tested using an electrical heat source to simulate the absorbed solar energy. The research included both experimental and analytical investigations on the collector elements and on the complete system. All day tests were performed on two commercial integral collector storage solar domestic hot water systems. Tests were performed under a variety of ambient conditions and irradiance levels. An analytical model was developed to predict the thermal performance of one of the systems. Predicted performance was compared with experimental results. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N85-29399 Institut d'Aeronomie Spatiale de Belgique, Brussels.
OZONE AND TEMPERATURE TRENDS DUE TO THE INJECTION OF TRACE SPECIES IN THE ATMOSPHERE
Guy Brasseur 1984 22 p refs Presented at Comm. of the European Comm. Seminar, 18 May 1984 Sponsored by Chemical Manufacturers Association
(Aeronomica-Acta-A-288-1984) Avail: Issuing Activity

A model of ozone and temperature changes due to the injection into the atmosphere of trace species produced by human activity is presented. The model includes a chemical and photochemical scheme, taking into account the action of oxygen, hydrogen, nitrogen, chlorine and carbon species. The radiative transfer in the infrared is treated by determining the transmission function in four large spectral intervals. The upward and downward infrared flux and the corresponding cooling rates are obtained by solving the radiative transfer equation in which the transmission functions are parameterized as a function of the amount of absorbing gases. An energy balance is achieved at the top of the atmosphere assuming a global Earth-atmosphere albedo of 0.3. The model extends from 0 to 70 km. Vertical transport is parameterized by an eddy diffusion coefficient. Significant stratospheric changes are predicted. Author (ESA)

N85-29400# SRI International Corp., Menlo Park, Calif.
TOXICITY OF TNT WASTEWATERS TO AQUATIC ORGANISMS.

VOLUME 4: CHRONIC TOXICITY OF 2,4-DINITROTOLUENE AND CONDENSATE WATER Final Report, 15 Dec. 1978 - 30 Apr. 1982
H. C. Bailey, R. J. Spanggord, H. S. Javitz, and D. H. W. Liu Jul. 1984 91 p
(Contract DAMD17-75-C-5056; DA Proj. 3E1-62720-A-835)
(AD-A153536; SRI-LSU-4262) Avail: NTIS HC A05/MF A01 CSCL 06/20

This report is the last in a series of four reports on the toxicity of 2,4,6-trinitrotoluene (TNT) wastewaters to aquatic organisms. The information presented in the four volumes was developed in a study performed by SRI International for the U.S. Army Medical Research and Development Command (USAMRDC). The study was undertaken to assist USAMRDC in developing a data base for assessing the potential hazards to aquatic life of wastewater from TNT manufacturing and processing plants. This report presents and discusses the results of early life stage and chronic studies on 2,4-dinitrotoluene (2,4-DNT), condensate water, and photolyzed condensate water. 2,4-DNT is a major component of the condensate wastewater that results from treatment of the effluent (red water) that comes from the continuous production of TNT. Condensate water is a synthetic blend based on the actual condensate wastewater and developed by SRI under a separate contract. Early life stage studies were conducted on 2,4-DNT and condensate water with rainbow trout, channel catfish and fathead minnows. Full life-cycle chronic studies were performed on 2,4-DNT and condensate water with fathead minnows and Daphnia magna and on irradiated condensate water with D. magna. GRA

N85-29401# Lamont-Doherty Geological Observatory, Palisades, N. Y.
RECONSTRUCTION OF PAST ATMOSPHERIC CO/SUB 2/ CONTENTS FROM THE CHEMISTRY OF THE CONTEMPORARY OCEAN: AN EVALUATION
W. S. Broecker, Taro Takahashi, and Tsung-Hung Peng (ORNL) Mar. 1985 87 p refs
(Contract DE-AC05-84OR-21400)
(DE85-008426; DOE/OR-857) Avail: NTIS HC A05/MF A01

Previous attempts to reconstruct the preanthropogenic CO2 content of the atmosphere from (SIGMA)CO2, alkalinity, and CO2 partial pressure (pCO2) data for the contemporary ocean are evaluated. Also, new attempts based on the more extensive Transient Tracers in the Ocean (TTO) data for the North Atlantic are made. The conculsion is that such quests are quite likely destined to failure in that the uncertainties in the reconstructions will always be larger than the uncertainties ultimately available from other approaches (i.e., ice cores and (13)C record deconvolutions). The difficulty lies in the fact that successful deconvolution requires the solution of a host of basic problems in the ocean sciences. The value of the ocean data set lies in understanding the processes taking place in the sea rather than in reconstructing past atmospheric CO2 contents. Once the history of atmospheric CO2 has been reconstructed from ice core CO2 and (13)C deconvolutions, the ocean (SIGMA)CO2 and pCO2 data will become a useful tracer in studies of ocean chemistry and ventilation. DOE

N85-29402# Atmospheric Dynamics Corp., Victoria (British Columbia).
HUMIDITY/CLOUD-RADIATION FEEDBACK ON POSSIBLE CLIMATE PERTURBATION DUE TO FOSSIL FUEL UTILIZATION Technical Progress Report
Wei-Chyung Wang Mar. 1985 4 p
(Contract DE-AC02-81ER-60023)
(DE85-008886; DOE/ER-60023/T2) Avail: NTIS HC A02/MF A01

Highlights of accomplishments in climate modeling activities achieved during the period April 1984 to February 1985 are briefly summarized. Discussion is presented under the headings: uncertainties of the model calculated direct CO2 radiative effects; atmospheric CO2 and radiation balance; radiation treatment (models); humidity/cloud-radiation interaction; model comparison studies; and DOE state-of-the-art report. DOE

N85-29403# Santa Clara Univ., Calif. Dept. of Mechanical Engineering.
IMPACT OF ALCOHOL FUELS ON URBAN AIR POLLUTION: METHANOL PHOTOCHEMISTRY STUDY Final Report
R. K. Pefley, B. Pullman, and G. Whitten Nov. 1984 81 p refs
(Contract DE-FG03-84CE-50036)
(DE85-009539; DOE/CE-50036/1) Avail: NTIS HC A05/MF A01

Experimental evidence was obtained to support methanol's low photochemical reactivity when substituted for typical urban hydrocarbons. This evidence supports a previous urban modeling study in which significant ozone reductions were predicted with large scale methanol substitution for gasoline. An improved (urban hydrocarbon) chemical kinetic mechanism was also partially validated along with methanol's photochemistry. DOE

N85-29404# Argonne National Lab., Ill. Environmental Research Div.
ENVIRONMENTAL RESEARCH DIVISION REPORT: ATMOSPHERIC PHYSICS Annual Report, Jan. - Dec. 1983
Dec. 1984 82 p refs
(Contract W-31-109-eng-38)
(DE85-009659; ANL-83-100-Pt-4) Avail: NTIS HC A05/MF A01

A sample of the research conducted in 1983 by the atmospheric physics program of the environmental research division is reproted. The research deals with atmospheric physical processes, however, a substantial component deals with chemical process. The atmospheric behavior and deposition rates of acidifying substances is emphasized, and the transport, diffusion, or deposition of atmospheric sulfur and nitrogen compounds are addressed. Numerical modeling and experimental studies are parallel activities in the program and draw upon each other for information and guidance. DOE

N85-29405# Woodrow Wilson International Center for Scholars, Washington, D.C. American Society and Politics Program.
ENVIRONMENTAL MANAGEMENT NEEDS Final Report, 19 Sep. 1983 - 31 Dec. 1984
1984 674 p refs Proc. of the Conf. on the Evolution of Am. Environ. Politics, Washington, D.C., 28 Jul. 1984
(Contract DE-FG01-83EP-16032)
(DE85-007859; CONF-8406246) Avail: NTIS HC A99/MF E03

The origins, evolution, and current circumstances of some of the most important institutions and public policies at the national level in the field of environmental affairs were investigated from a historical perspective. Selected topics in both the regulatory area and in the area of preservation and management of resources were covered. DOE

N85-29406# Los Alamos Scientific Lab., N. Mex.
ANALYSIS AND MODEL/DATA COMPARISONS OF LARGE-SCALE RELEASES OF NITROGEN TETROXIDE
T. G. McRae Mar. 1985 78 p refs
(Contract W-7405-eng-48)
(DE85-009989; UCID-20388) Avail: NTIS HC A05/MF A01

Large-scale spills (3 to 5 cu m) of nitrogen tetroxide (N2O4) were tested at the Nevada Test Site (NTS). The evaporation rates and heavy gas dispersion aspects of realistic size releases of N2O4, a rocket fuel oxidizer for the Titan II missile system were studied. The Titan II complexes are being decomissioned, resulting in an increase in the overland transportation of this toxic material. The N2O4 vapor is heavier-than-air and forms a nitric acid mist in close to the spill area. As it disperses downwind, it dissociates to nitrogen dioxide (NO2), which has a TLV level of 3 ppm. The field experiment is described and the accuracy of the experimental results are discussed. The predictions of several source strength and simple Gaussian dispersion models are compared to the results. DOE

N85-29407# Rhode Island Univ., Narragansett. Center for Atmospheric Chemistry Studies.
ELEMENTAL TRACERS OF SOURCE REGIONS OF CONTAMINANTS IN PRECIPITATION Quarterly Report, 1 Nov. 1984 - 31 Oct. 1985

Kenneth A. Rahn 1 Mar. 1985 5 p
(Contract DE-FG22-84PC-71253)
(DE85-007366; DOE/PC-71253-1; QR-1) Avail: NTIS HC A02/MF A01

Start up accomplishments associated with the project are discussed. This includes equipment acquisition, testing of contamination of sample containers (sandwich bags) and preliminary sampling and analysis of atmospheric precipitations. DOE

N85-29408# Rome Univ. (Italy). Dipt. di Fisica.
STABILITY AND FEASIBILITY OF MODEL ECOSYSTEMS
G. Paladin, L. Peliti, and A. Vulpiani 25 Jan. 1985 18 p refs
(PREPRINT-431) Avail: NTIS HC A02/MF A01

A structure with preferential trophic channels is introduced in a two-level Lotka-Volterra model of an ecosystem. It is shown that if the system is feasible (i.e., if all biomasses are positive at equilibrium) then the equilibrium is stable and vice versa. The number of feasible models decreases exponentially with the number of species, if all other parameters are held fixed; feasibility almost vanishes whenever a preferential trophic channel structure is not assumed. For each structure and number of species there is an optimum interaction strength (or conversion factor) which maximizes feasibility. Author (ESA)

N85-29409# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna. Inst. fuer Chemie.
RADIATION-INDUCED DEGRADATION OF TRICHLOROETHYLENE AND TETRACHLOROETHYLENE IN DRINKING WATER
Peter Gehringer, Emil Proksch, and Walter Szinovatz Oct. 1984 10 p ref Submitted for publication Sponsored by Austrian Fonds zur Foerderung der Wissenschaftlichen Forschung
(OEFZS-4298; CH-336/84) Avail: NTIS HC A02/MF A01

The gamma-radiation degradation of trace amounts (70 to 440 ppb) of trichloroethylene and tetrachloroethylene in drinking water was investigated. The doses necessary to reduce the pollutant concentration to 1 ppb are of the order of 1 kGy. Author (ESA)

N85-29410# Research Inst. of National Defence, Umea (Sweden). Dept. 4.
EQUIPMENT DEVELOPMENT FOR RAPID DETECTION OF MICROORGANISMS IN AIR AND WATER
Pia Hallin Sep. 1984 36 p refs In SWEDISH; ENGLISH summary
(FOA-A-40046-B2; ISSN-0281-0220) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

A rapid detection system based on chemiluminescence techniques was developed to be used e.g., in biological warfare, for determining aerosols, spreading both in small and in large amounts, and for the biological control of drinking water. In field tests simulated biological aerosols show good agreement with the theoretical dispersion models. For a higher detection sensivity the background level must be lower. The bacteriological aerosol warning device requires skill for operation. Author (ESA)

N85-29411# Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Munich (West Germany). Bereich Projekttraegerschaften.
KINETICS AND INTENSITY OF PHOTOCHEMICAL PROCESSES IN THE ATMOSPHERE Final Report, Sep. 1981
W. Marx (Bonn Univ.), P. B. Monkhouse (Bonn Univ.), and U. Schurath (Bonn Univ.) Jun. 1984 91 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BPT-10/84; ISSN-0176-0777) Avail: NTIS HC A05/MF A01

The photolysis frequencies of aldhehydes under cloud-free conditions were measured in order to deduce the zenith angle dependencies. Pressure dependencies of several dissociation pathways (formation of radicals or stable molecular products) were investigated under laboratory and field conditions. The photolysis frequencies of nitrogen dioxide and methyl nitrite are determined with high precision. Combining all the data, zenith angle dependencies of eight at ground level photochemical processes are cast in simple parameter form. The results are suited for calculating photolysis frequencies in chemical models as a function of zenith angle (< 70 deg arc). Author (ESA)

N85-29412# Interuniversitair Reactor Instituut, Delft (Netherlands). Werkgroep Stralingshygiene en Dosimetrie.
PROGRAM RNTHR/2: AN HP-41 C PROGRAM FOR THE CALCULATION OF RaA, RaB, AND RaC CONCENTRATIONS IN AIR BASED ON THREE MEASUREMENTS OF AN AIR-DUST SAMPLE [PROGRAMMA RNTHR/2: EEN HP-41C PROGRAMMA VOOR DE BEREKENING VAN RaA, RaB, EN Rc CONCENTRATIES IN LUCHT UIT DRIE METINGEN VAN EEN LUCHTSTOFLMONSTER]
W. F. Passchier Sep. 1983 15 p refs In DUTCH
(IRI-190-83-10) Avail: NTIS HC A02/MF A01

A program for a Hewlet-Packard 41-C computer to analyze air dust samples based on 3 radioactivity counts of an air-dust sample is described. The program offers the possibility to introduce different measurement parameters for each count. Counts executed during sampling can be assimilated. Author (ESA)

N85-29413# Ruhrkohle A.G., Essen (West Germany).
DEVELOPMENT OF A STATIONARY CARBON MONOXIDE DETECTOR Final Report, Dec. 1983
Dieter Baack Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 85 p In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-84-253; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 18

A carbon monoxide detector was developed in order to improve the protection of persons and valuable material in underground mines against open and hidden fires. An existing air pollutant detector was modified. A potentiostatic functioning in the microampere range is obtained. Author (ESA)

N85-29414# Statewide Air Pollution Research Center, Riverside, Calif.
FORMATION AND FATE OF TOXIC CHEMICALS IN CALIFORNIA'S ATMOSPHERE Final Report, 20 Jan. 1983 - 20 Jul. 1984
James N. Pitts, Jr., Roger Atkinson, and Arthur M. Winer 19 Jul. 1984 94 p refs Sponsored by California Air Resources Board
(PB85-172609; ARB-R-85/239) Avail: NTIS HC A05/MF A01 CSCL 04A

Compounds representative of volatile toxic organics relevant to California's polluted ambient and occupational atmospheres are investigated. Compounds studied include 1.3-dichloropropene and tri-and tetrachloroethylene. Experiments were carried out using both in situ FT-IR spectroscopy and differential optical absorption spectroscopy to identify and quantify the reaction products. The atmospheric chemistry of toluene and o- and m-xylene was investigated. Alkyl nitrate (RONO2) yields were determined for a series of NOx air photooxidations of the branched and cyclic alkanes, neoperitane, 2.3-dimethylbutane, 2.2-dimethylbutane, 3-methylpentane and cyclohexane. GRA

N85-29415# Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
VERTICAL REDISTRIBUTION OF A POLLUTANT TRACER DUE TO CUMULUS CONVECTION Final Report, 1980 - 1984
John A. Ritter and Donald Stedman Feb. 1985 171 p refs
(PB85-172971; EPA-600/3-85-010) Avail: NTIS HC A08/MF A01 CSCL 04A

Mathematical formalisms that incorporate the physical processes responsible for the vertical redistribution of a conservative pollutant tracer due to a convective cloud field are presented. Two modeling approaches are presented differing in the manner in which the cloud fields are forced. The two approaches give internally consistent results and give results for the convective mass flux. The manner in which the upward mass flux is apportioned to the various cloud classes, however, differs as consequence of

the different vertical profile of forcing functions used. This study shows that the concentration increase in the cloud layer due to the venting action of cumulus clouds can be as, if not more important than, the in situ production and this process should therefore be incorporated in regional scale transport models. GRA

N85-29416# Brookhaven National Lab., Upton, N. Y. Environmental Chemistry Div.
CHEMICAL TRANSFORMATIONS IN ACID RAIN. VOLUME 2: INVESTIGATION OF KINETICS AND MECHANISM OF AQUEOUS-PHASE PEROXIDE FORMATION Final Report, Aug. 1983 - Jul. 1984
Yin-Nan Lee Mar. 1985 60 p refs
(PB85-173433; EPA-600/3-85-017-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 04A

The aqueous-phase reactions of O3 with a number of species have studied in an effort to identify pathways leading to the production of hydrogen peroxide in solution. The aqueous-phase systems studied included the decomposition of O3 in pure water and the interaction of O3 with (1) NO2, (2) PAN, (3) ethylene, (4) formic acid, (5) formaldehyde and (6) formaldehyde in the presence of NO2. Except for the O3-ethylene reaction, peroxide was not found as a reaction product. From the results obtained, it is concluded that the reactions studied in this research effort are not significant with respect to atmospheric peroxide formation.
Author (GRA)

N85-29417# SRI International Corp., Menlo Park, Calif. Atmospheric Science Center.
CONCEPTUAL DESIGN FOR A GULF COAST OXIDANT TRANSPORT AND TRANSFORMATION EXPERIMENT: WORKSHOP PROCEEDINGS AND RECOMMENDATIONS Final Report
Walter F. Dabberdt, William Viezee, and Hanwant B. Singh Mar. 1985 93 p refs Workshop held in Durham, N.C., Nov. 1983
(Contract EPA-68-02-3752)
(PB85-173789; EPA-600/9-85-008) Avail: NTIS HC A05/MF A01 CSCL 04A

Thirty atmospheric scientists from government, industry, academia, and the private research sector participated in a workshop in November 1983, in Durham, NC to develop a conceptual design for a study of ozone transport and transformation in the western Gulf coast area. The purpose of the study would be to better understand the unique meteorology and chemistry of the region, and to effectively adapt the EPA regional Oxidant Model to that geographic area. Working groups focused on the problems of meteorology and atmospheric chemistry and measurement needs and methods. A conceptual design was developed for a five-year program that would include preparatory studies, the 3-month primary experimental program, and data analysis.
Author (GRA)

N85-29418*# Tennessee Valley Authority, Muscle Shoals, Ala. Air Quality Section.
METHODS FOR SIMULATING GAS PHASE SO2 OXIDATION IN ATMOSPHERIC MODELS Final Report, Mar. 1983 - Jul. 1984
James F. Meagher and Kenneth J. Olszyna Feb. 1985 86 p refs
(PB85-173110; EPA-600/E-85-012) Avail: NTIS HC A05/MF A01 CSCL 07D

Two different approaches are presented for simulating gas phase sulfur dioxide oxidation in atmospheric models. The first approach was to develop an empirical relationship based on rate data collected at four coal fired power plants during 11 separate studies. Cosine functions were used to simulate annual and diurnal variations in the oxidation rate constant. The second approach was to develop a kinetic model based on data obtained from smog chamber experiments using mixtures of sulfur dioxide, propene, butane, nitrogen oxides, and water vapor. Sulfur dioxide oxidation in the gas phase was found to occur by two mechanisms. At low HC/NOx values hydroxyl radical addition to sulfur dioxide predominates. At high HC/NOx values, oxidation via reaction with products of the ozone olefin reaction dominates. Author (GRA)

N85-29419# Unisearch Associates, Inc., Concord (Ontario).
FIELD MEASUREMENTS WITH THE TAMS-2B AND DEVELOPMENT OF METHODS FOR MEASURING HCHO, HC3 AND HONO IN REAL AIR
G. I. Mackay and H. I. Schiff Dec. 1984 143 p
(PB85-172955; CRC-APRAC-CAPA-19-80-04) Avail: NTIS HC A07/MF A01 CSCL 14B

The two beam tropospheric air monitoring system (TAMS-2B) developed by Unisearch was installed in a mobile laboratory and employed in a field measurement program. As part of the continuing program, modifications were made that now allow the TAMS-2B to be taken into the field and measurements in the sub-ppbv region to be routinely made. These changes include improved real time data handling and modifications to some of the system electronics. The feasibility of measuring dry deposition velocities by the gradient method was also investigated. GRA

N85-29489# Technische Hochschule, Aachen (West Germany).
DIFFUSION OF TRACE GASES IN THE GROUND LEVEL BOUNDARY LAYER [AUSBREITUNG VON SPURENGASEN IN DER BODENNAHEN GRENZSCHICHT]
S. Kuelske *In its* Heilmut Berg Issue 1984 p 74-80 In GERMAN
(For primary document see N85-29483 18-47)
Avail: NTIS HC A06/MF A01

N85-29542*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
STATEMENT OF CONTAMINATION PROBLEM
W. Hoffler *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 10 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29543*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INTERNAL CONTAMINATION ISSUES
L. Rockoff *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 16 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29545*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VENTILATION FLOW: SUBMERGED
D. Hutchinson *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 30 p ref (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29546*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMBIENT AIR CONTAMINATION: CHARACTERIZATION AND DETECTION TECHNIQUES
C. P. Nulton and H. S. Silvus *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 9 p refs (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29549*# Hamilton Standard, Hartford, Conn.
INTERNAL CONTAMINATION IN THE SPACE STATION
Chris Poythress *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 25 p refs (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29550*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION TRACE CONTAMINANT CONTROL
T. Olcutt *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 16 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29551*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GAS CHROMATOGRAPHY: POSSIBLE APPLICATION OF ADVANCED INSTRUMENTATION DEVELOPED FOR SOLAR SYSTEM EXPLORATION TO SPACE STATION CABIN ATMOSPHERES
Glenn C. Carle *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 15 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29552*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MASS SPECTROMETRY TECHNOLOGY AT THE JET PROPULSION LABORATORY (JPL)
Charles E. Giffin *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 17 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29553*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ATMOSPHERE MONITORING REQUIREMENTS
M. Ruecker *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 29 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29554*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOME PROBLEMS ASSOCIATED WITH TRACE CONTAMINANT REMOVAL SYSTEMS FOR SPACECABINS
T. Wydeven *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 15 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

N85-29555*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTAMINATION CONTROL FOR INCREASED CREW PRODUCTIVITY
D. B. Heppner and C. W. Miller *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 29 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N85-29420*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
APPLICATION OF THE MHD ENERGY PRINCIPLE TO MAGNETOSTATIC ATMOSPHERES
Ellen G. Zweibel [1984] 21 p refs
(Grant NAGw-31; Contract DE-AC02-76CH-03073)
(NASA-CR-175967; NAS 1.26:175967) Avail: NTIS HC A02/MF A01 CSCL 04A

The MHD energy principle is applied to the stability of a magnetized atmosphere which is bounded below by much denser fluid, as is the solar corona. The two fluids are treated as ideal; the approximation is consistent with the energy principle, and the dynamical conditions that must hold at a fluid-fluid interface are used to show that if vertical displacements of the lower boundary are premitted, then the lower atmosphere must be perturbed as well. However, displacements which do not perturb the coronal boundary can be properly treated as isolated perturbations of the corona alone. F.M.R.

N85-29421*# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
AURORAL ZONE ELECTRIC FIELDS FROM DE-1 AND -2 AT MAGNETIC CONJUNCTIONS Progress Report
D. R. Weimer, C. K. Goertz, D. A. Gurnett, N. C. Maynard (Air Force Geophysics Lab., Hanscom AFB, Mass.), and J. L. Burch (Southwest Research Inst., San Antonio, Tex.) 28 Dec. 1984 76 p refs
(Contracts NAS5-26363; NAS5-25693; Grants NAG5-310; NGL-16-001-043; NGL-16-001-002; Contract N00014-76-C-0016)
(NASA-CR-175974; NAS 1.26:175974; AD-A153510; U-Of-Iowa-84-22) Avail: NTIS HC A05/MF A01 CSCL 04A

Nearly simultaneous measurements of auroral zone electric fields are obtained by the Dynamics Explorer spacecraft at altitudes below 900 km and 4,500 km during magnetic conjunctions. The measured electric fields are usually perpendicular to the magnetic field lines. The north-south meridional electric fields are projected to a common altitude by a mapping function which accounts for the convergence of the magnetic field lines. When plotted as a function of invariant latitude, graphs of the projected electric fields are measured by both DE-1 and DE-2 show that the large-scale electric field is the same at both altitudes, as expected. Superimposed on the large-scale fields, however, are small-scale features with wavelengths less than 100 km which are larger in magnitude at the higher altitude. Fourier transforms of the electric fields show that the magnitudes depend on wavelength. Outside of the auroral zone the electric field spectrums are nearly identical. But within the auroral zone the high and low altitude electric fields have a ratio which increases with the reciprocal of the wavelength. The small-scale electric field variations are associated with field-aligned currents. These currents are measured with both a plasma instrument and magnetometer on DE-1. GRA

N85-29422# Miami Univ., Fla. School of Marine and Atmospheric Science.
ATMOSPHERIC PROBING BY ACTIVE MILLIMETER WAVE SYSTEM Final Report, 15 Mar. - 14 Jul. 1984
R. Lhermitte Mar. 1985 19 p
(Contract DAAG29-82-K-0082)
(AD-A153550; ARO-18627.2-GS) Avail: NTIS HC A02/MF A01 CSCL 17/9

The objectives of the contract are to design, assemble, and test a W-band Doppler radar operating at a frequency of 94 GHZ (lambda = 3.3 mm). The ultimate goal of the project is to use the radar in a cloud physics research program. The radar design is based on an MTI scheme in which the transmitter RF pulse produced by an Extended Interaction Oscillator phase-locks a Coho IF signal. A gunn diode oscillator phase-locked on a crystal oscillator signal provides the STALO input to the mixers. The radar is equipped with two separate transmitter and receiver antenna having a 3-foot diameter. The receiver mixer noise figure is 6.5 dB DSB and the transmitter power s 1.2 kW. Pulse width can be adjusted between 0.1 to 2 microns, and Pulse Repetition Rate between 2.5 to 20 KHZ. The radar is completed and tested. Test results indicate that the Doppler operation is satisfactory and that the minimum range at which the radar can operate is approximately 60 m (400 ns), as primarily limited by the IF amplifier recovertie. The Doppler radar is equipped with an on-line signal processor for real-time evaluation of mean Doppler frequency and mean signal intensity. GRA

N85-29423# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
IMAGES OF THE EARTH'S AURORA AND GEOCORONA FROM THE DYNAMICS EXPLORER MISSION
L. A. Frank, J. D. Craven, and R. L. Rairden Jan. 1985 42 p refs
(Contract NAS5-25689; Grant NGL-16-001-002; Contract N00014-76-C-0016)
(NASA-CR-175983; NAS 1.26:175983; AD-A153757; U-OF-IOWA-85-2) Avail: NTIS HC A03/MF A01 CSCL 04/1

Several results from analyses of auroral and geocoronal images from the Dynamics Explorer Mission are summarized.

(1) The motion of the transpolar arc of a theta aurora is found to be correlated with the y-component of the interplanetary magnetic field. The arc motion is in the general direction of the y-component (2) A sequence of global images of a small auroral substorm shows the initial development of intense luminosities in a relatively small spatial region, or bright spot m, in the pre-midnight sector of the auroral oval and a subsequent appearance of an expending area of lesser intensities at lower latitudes and contiguous to the midnight boundary of the bright spot. This evolution of auroral luminosities is interpreted in terms of acceleration of electrons in the boundary layer of the magnetotail plasma sheet to produce the bright spot and subsequent injection into, and eastward drift within, the plasma sheet to form the diffuse area of lesser intensities, (3) A series of images of the Earth's geocorona in scattered solar Ly alpha emissions is used to obtain a best-fit spherical model of atomic hydrogen densities in the Earth's exosphere. A Chamberlain model provides an adequate fit to radial distances of 4.5 sub RE, beyond which an exponential fit is used. The geocoronal tail detected as an asymmetric increase in scattered Ly alpha intensities in the anti-solar direction.

Author (GRA)

N85-29424# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

SIMPLE SOLAR SPECTRAL MODEL FOR DIRECT AND DIFFUSE IRRADIANCE ON HORIZONTAL AND TILTED PLANES AT THE EARTH'S SURFACE FOR CLOUDLESS ATMOSPHERES

R. Bird and C. Riordan Dec. 1984 36 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002933; SERI/TR-215-2436) Avail: NTIS HC A03/MF A01

A new, simple model for calculating clear sky direct and diffuse spectral irradiance on horizontal and tilted surfaces is presented. The model is based on previously reported simple algorithms and on comparisons with rigorous radiative transfer calculations and limited outdoor measurements. Equations for direct normal irradiance are outlined; and include: Rayleigh scattering; aerosol scattering and absorption; water vapor absorption; and ozone and uniformly mixed gas absorption. Inputs to the model include solar zenith angle, collector tilt angle, atmospheric turbidity, amount of ozone and precipitable water vapor, surface pressure, and ground albedo. The model calculates terrestrial spectra from 0.3 to 4.0 (MU)m with approximately 10 nm resolution. A major goal of this work is to provide researchers with the capability to calculate spectral irradiance for different atmospheric conditions and different collector geometries using microcomputers. A listing of the computer program is provided. DOE

N85-29425# Sandia Labs., Albuquerque, N. Mex. Ground Motion and Seismic Div.

SURFACE WAVESEISMIC YIELDS AS MEASURED BY THE REGIONAL SEISMIC TEST NETWORK

H. Douglas Garbin Mar. 1985 13 p refs
(Contract DE-ac04-76DP-00789)
(DE85-010532; SAND-84-1507) Avail: NTIS HC A02/MF A01

Long period surface wave data recorded by the Regional Seismic Test Network (RSTN) are being analyzed for use as a yield index. Short period yield estimates require a large number (approx. 10) of calibration events in a very localized region before a reasonable degree of confidence can be gained. The results of the study are promising, and the following conclusions were reached: (1) the surface wave detection threshold is much higher than for short period waves; (2) Rayleigh wave amplitude calibration curves are not much of an improvement over the short period results; and (3) tectonic strain release accounts for a significant portion of energy in the signal, and if a normal strike slip source is assumed, corrections can be made to reduce the rms to 1.22 in the frequency window from 0.04 to 0.07 Hz. DOE

N85-29426*# Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Munich (West Germany). Bereich Projekttraegerschaften.

IMPROVEMENT OF THE BASIC KNOWLEDGE OF THE CLIMATOLOGY OF THE VERTICAL OZONE LAYER BY ENHANCED BALLOON SOUNDING Final Report [VERBESSERUNG DER GRUNDKENNTNISSE UEBER DIE KLIMATOLOGIE DER VERTIKALEN OZONSCHICHT DURCH VERSTAERKTE BALLONSONDIERUNG]

W Attmannspacher (Deutscher Wetterdienst Meteorologisches Observatorium), R. Hartmannsgrubber (Deutschew Wetterdienst Meteorologisches Observatorium), and P. Lang (Deutscher Wetterdienst Observatorium) Jun. 1984 46 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BPT-6/84; ISSN-0176-0777) Avail: NTIS HC A03/MF A01

Balloon sounding of the ozone in the Earth atmosphere was performed in order to determine the natural behavior of ozone and its recognizable deviations. The importance of ozone in the Earth atmosphere and the orographic situation of observatories and ozone sounding statistics since 1966 are explained. The physical processes governing the total amount of ozone, and the behavior of stratospheric ozone are described. Measurements in the upper stratosphere show a decrease of the ozone partial pressure above 26 km altitude since 1977. The behavior of tropospheric ozone is discussed. Data since 1977 show increasing ozone values in the troposphere, up to 50% to 70%. This increase is independent of the solar radiation intensity and the reinforced transport of stratospheric ozone into the troposphere. The increase in the troposphere cannot compensate the stratospheric decrease. Author (ESA)

N85-29427# Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Munich (West Germany).

INVESTIGATION OF THE REACTION SYSTEM NOX/ClOX/HOX UNDER TROPOSPHERIC AND STRATOSPHERIC CONDITIONS Final Report, Jul. 1984

Ian Barnes (Gesamthochschule, Wuppertal, West Germany), Volker Bastian (Gesamthochschule, Wuppertal, West Germany), Karl-Heinz Becker (Gesamthochschule, Wuppertal, West Germany), Ewald H. Fink (Gesamthochschule, Wuppertal, West Germany), Thomas Klein (Gesamthochschule, Wuppertal, West Germany), Volker Kriesche (Gesamthochschule, Wuppertal, West Germany), Willi Nelsen (Gesamthochschule, Wuppertal, West Germany), Axel Reimer (Gesamthochschule, Wuppertal, West Germany), and Friedholm Zabel (Gesamthochschule, Wuppertal, West Germany) Jul. 1984 48 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BPT-11/84; ISSN-0176-0777) Avail: NTIS HC A03/MF A01

Physico-chemical processes in the atmosphere were investigated in laboratory experiments. A reaction chamber in which photochemically initiated gas phase reactions can be studied over wide ranges of temperature and total pressure was constructed. Kinetic metnods for measuring relative rate constants of reactions of OH, Cl, and H2O radicals with gaseous substances of atmospheric interest are explained. Reactions of OH radicals with different alkenes, aromatics, sulfur containing compounds, and peroxynitric acid are discussed. Author (ESA)

N85-29428# Royal Netherlands Meteorological Inst., De Bilt. Geofysisch Onderzoek.

PROPAGATION OF GRAVITY WAVES IN THE ATMOSPHERE AND AROUND CRITICAL LEVELS [VOORTPLANTING VAN ZWAARTE GOLVEN IN DE ATMOSFEER EN ROND EEN KRITIEKE LAAG]

E. R. Stolp 1985 82 p refs In DUTCH; ENGLISH summary
(KNMI-WR-85-1; B8562307; ISSN-0169-1651) Avail: NTIS HC A05/MF A01

The motion and behavior of gravity waves around critical levels, originated by a Doppler effect equaling the wave frequency and caused by background winds on the waves is treated. The motion of a gravity wave in an atmosphere with a vertical wind gradient, based on the dispersion relation of the waves, is analyzed. The critical level is treated with Taylor-Goldstein equations and the impact of viscosity and thermal conductivity around it. Observation of the waves in the ionosphere by radio signals of a navigation satellite is described. Author (ESA)

N85-29429# Sattleger Ingenieurbuero fuer Angewandte Geophysik, Meppen (West Germany).
WAVE-THEORETICAL APPROACH TO SEISMIC MODELING PROBLEMS (WELMOD) Final Report, Jun. 1983
Johann Sattleger and Gerhard Dohr (Preussag A.G., Erdoel und Erdgas) Bonn Bundesministerium fuer Forschung und Technologie Dec. 1984 98 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie (BMFT-FB-T-84-258; ISSN-0340-7608) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20.50

The propagation of seismic compressional waves in two-dimensional arbitrarily heterogeneous media was investigated. Seismic model experiments were performed and a finite difference modeling program based on the elastic wave equation was developed. An inverse modeling system for seismic reflection data based on the scalar wave equation is developed. Author (ESA)

N85-29430# National Oceanic and Atmospheric Administration, Boulder, Colo. National Geophysical Data Center.
COMBINED CATALOG OF IONOSPHERE VERTICAL SOUNDINGS DATA
R. Conkright, comp., M. Ertle, comp., A. Feldstein, comp., M. Hapgood, comp., and N. Matuura, comp. Dec. 1984 185 p (PB85-166494; LC-78-646735; UAG-91) Avail: NTIS HC A09/MF A01 CSCL 04A

This catalog is a first attempt to consolidate the inventories of the four World Data Centers which hold ionospheric vertical soundings data. Listings of all ionosphere vertical sounding stations known to have existed regardless of whether a station is open, closed, or the data held in the World Data Center system. A map showing the location of these stations are described. The data types and formats with an explanation of the symbols in the catalog. The catalog of ionosphere vertical soundings data held in the WDC system is presented. The regular World Days are listed. GRA

N85-29431# Argonne National Lab., Ill. Environmental Research Div.
VARIABILITY OF SHORT TERM EDDY-CORRELATION ESTIMATES OF MASS EXCHANGE
M. L. Wesely and R. L. Hart Feb. 1985 26 p refs (PB85-172641; EPA-600/D-85-039) Avail: NTIS HC A03/MF A01 CSCL 14B

The signals from sensors used to measure atmospheric scalar fluctuations ordinarily produce characteristic spectra and cospectra with vertical wind velocity that are strongly influenced by vertical transport processes. Unwanted signal noise generated by some of the fast response chemical sensors, however, distort the spectra and cospectra and increase run to run variability of eddy correlation flux estimates. Instead of data collection periods of only 30 min needed to provide a precision of approximately 10-20% in each flux estimate obtained at heights of 5-10 m during ideal daytime conditions, an ensemble derived from several such runs is necessary with certain sensors in order to achieve comparable precision. GRA

N85-29233*# Air Force Geophysics Lab., Hanscom AFB, Mass. Ionospheric Physics Div.
A REVIEW OF IONOSPHERIC EFFECTS ON EARTH-SPACE PROPAGATION Abstract Only
John A. Klobuchar *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 225-228 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20N

N85-29234*# Naval Research Lab., Washington, D. C. Ionospheric Effects Branch.
IONOSPHERIC LIMITATIONS TO TIME TRANSFER BY SATELLITE
S. H. Knowles *In* NASA. Goddard Sace Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1983 p 229-245 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20N

N85-29235*# Rome Air Development Center, Hanscom AFB, Mass. Electromagnetic Sciences Div.
A REVIEW OF TROPOSPHERIC REFRACTION EFFECTS ON EARTH-TO-SATELLITE SYSTEMS Abstract Only
Edward E. Althsuler *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1983 p 247-248 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 20N

N85-29442*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH-LATITUDE FILTERING IN A GLOBAL GRID-POINT MODEL USING MODEL NORMAL MODES
Lawrence L. Takacs, I. M. Navon, and Eugenia Kalnay *In its* Res. Rev., 1983 Jan. 1985 p 26-27 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29459*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF FORECAST AND OBSERVED ENERGETICS Abstract Only
Wayman E. Baker and Yevgenia Brin (Sigma Data Services Corp., Greenbelt, Md.) *In its* Res. Rev., 1983 Jan. 1985 p 73-76 ref Previously announced as N85-14389 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01

N85-29464*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE VERTICAL STRUCTURE OF GLOBAL ROTATIONAL NORMAL MODES Abstract Only
David M. Straus *In its* Res. Rev., 1983 Jan. 1985 p 86-87 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29469*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE GLOBAL DISTRIBUTION OF THREE-DIMENSIONAL ELIASSEN-PALM FLUXES BY STATIONARY WAVES Abstract Only
Glenn H. White *In its* Res. Rev., 1983 Jan. 1985 p 100-102 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29470*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSIENT EDDIES IN THE UCLA GCM Abstract Only
Glenn H. White *In its* Res. Rev., 1983 Jan. 1985 p 103-104 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29474*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELIMINARY GCM RESULTS WITH A NEW RADIATION PARAMETERIZATION Abstract Only
Dave Randall, Harshvardhan, R. Davies, and Tom Corsetti *In its* Res. Rev., 1983 Jan. 1985 p 113-114 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29475*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTIPLE EQUILIBRIA OF THE BAROTROPIC VORTICITY EQUATION ON A SPHERE Abstract Only
Max J. Suarez *In its* Res. Rev., 1983 Jan. 1985 p 115-119 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29476*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW CO2 TRANSMITTANCE PARAMETERIZATION AND ITS IMPACT ON THE GLA GCM Abstract Only
Richard Wobus, M.-L. C. Wui, and Joel Susskind *In its* Res. Rev., 1983 Jan. 1985 p 120-121 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29479*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFLUENCE OF LAND-SURFACE ROUGHNESS ON ATMOSPHERIC CIRCULATION AND RAINFALL: A SENSITIVITY STUDY WITH A GCM Abstract Only
Yogesh C. Sud, J. Shukla, and Yale Mintz (Maryland Univ., College Park) *In its* Res. Rev., 1983 Jan. 1985 p 129-130 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29482*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LARGE-EDDY SIMULATION IN PLANETARY BOUNDARY-LAYER RESEARCH Abstract Only
J. C. Wyngaard *In* NASA. Goddard Space Flight Center Res. Rev., 1983 Jan. 1985 p 140-141 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

N85-29490# Technische Hochschule, Aachen (West Germany).
PHOTOCHEMICAL PROCESSES IN THE LOWER STRATOSPHERE (OZONE LAYER) [PHOTOCHEMISCHE PROZESSE IN DER UNTEREN STRATOSPHAERE (OZONSCHRICHT)]
Ulrich Schmidt *In its* Hellmut Berg Issue 1984 p 81-87 refs In GERMAN (For primary document see N85-29483 18-47)
Avail: NTIS HC A06/MF A01

N85-29491# Technische Hochschule, Aachen (West Germany).
CIRCULATION AND TRANSPORT IN THE MIDDLE ATMOSPHERE: TROPOSPHERE AND LOWER ATMOSPHERE [ZIRKULATION UND TRANSPORTE IN DER MITTLEREN ATMOSPHAERE: TROPOSPHAERE UND UNTERE STRATOSPHAERE]
P. Speth *In its* Hellmut Berg Issue 1984 p 88-91 In GERMAN (For primary document see N85-29483 18-47)
Avail: NTIS HC A06/MF A01

N85-29492# Technische Hochschule, Aachen (West Germany).
CIRCULATION AND TRANSPORT IN THE MIDDLE ATMOSPHERE: MESOSPHERE AND LOWER THERMOSPHERE [ZIRKULATION UND TRANSPORT IN DER MITTLEREN ATMOSPHAERE: MESOSPHAERE UND UNTERE THERMOSPHAERE]
A. Ebel *In its* Hellmut Berg Issue 1984 p 92-98 refs In GERMAN (For primary document see N85-29483 18-47)
(Contracts DFG-EB-56/63; DFG-EB-56/9-3)
Avail: NTIS HC A06/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N85-29432*# National Aeronautics and Space Administration, Washington, D. C.
CONTRIBUTIONS ON THE SUBJECT OF LONGITUDINAL MOVEMENTS OF AIRCRAFT IN WIND SHEARS Ph.D. Thesis - Technischen Univ., 1983
Peter Krauspe Jun. 1985 228 p refs Transl. into ENGLISH of German Thesis p 1-233 Original language document was announced in IAA as A84-45526 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-4004)
(NASA-TM-77837; NAS 1.15:77837) Avail: NTIS HC A11/MF A01 CSCL 04B

The effect of downburst-type wind shears on the longitudinal dynamic behavior of an unguided aircraft is simulated numerically on the basis of published meteorological data and the flight characteristics of an A300-B passenger jet. The nonlinear differential equations of the aircraft motion are linearized by conventional methods, and the wind effects are introduced via the linear derivatives of the wind components referred to the wind gradients to obtain simplified technical models of the longitudinal response to all possible types of constant-gradient wind shears during the first 20-60 sec. Graphs, maps, and diagrams are provided, and a number of accidents presumed to have involved wind shears are analyzed in detail. (IAA)

N85-29433*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESEARCH REVIEW, 1983
Jan. 1985 155 p refs Submitted for publication
(NASA-TM-86219; NAS 1.15:86219) Avail: NTIS HC A08/MF A01 CSCL 04B

A variety of topics relevant to global modeling and simulation are presented. Areas of interest include: (1) analysis and forecast studies; (2) satellite observing systems; (3) analysis and forecast model development; (4) atmospheric dynamics and diagnostic studies; (5) climate/ocean-air interactions; and notes from lectures. For individual titles, see N85-29434 through N85-29482.

N85-29434*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSIS OF OCEAN SURFACE WIND FIELDS USING SEASAT-A SCATTEROMETER DATA Abstract Only
Eugenia Kalnay and R. Atlas *In its* Res. Rev., 1983 Jan. 1985 p 3-5 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

In addition to the SEASAT forecast impact studies previously conducted with the GLA model, a study was also made of the global analyses of surface wind stress, wind stress curl, and surface sensible and latent heat fluxes, which are generated as a by-product of the assimilation process. Both instantaneous analyses of these quantities and 15-day averages of each of these fields were found to be in good qualitative agreement with published fields. G.L.C.

N85-29435*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FORECAST IMPACT SIMULATION STUDIES Abstract Only
R. Atlas, Eugenia Kalnay, Wayman E. Baker, Joel Susskind, Dennis Reuter, and Milton Halem *In its* Res. Rev., 1983 Jan. 1985 p 6-7 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

A series of simulation experiments is being conducted as a cooperative effort between the European Center for Medium Range Weather Forecasts (ECMWF), the National Meteorological Center (NMC) and the Goddard Laboratory for Atmospheres (GLA), to provide a quantitative assessment of the potential impact of proposed observing systems on large scale numerical weather prediction. For these studies an advanced analysis/forecast simulation system was developed which provides for a more realistic assessment of the impact of proposed observing systems than was possible in earlier studies. This system consists of four elements: (1) An atmospheric model integration to provide a complete record of the true state of the atmosphere (called nature); (2) a conventional data assimilation cycle that is used as the control experiment; (3) a satellite data assimilation that differs from the control in also including fabricated satellite data incorporated in the forecast-analysis cycle; and (4) forecasts produced from both control and satellite initial conditions. Comparison of these forecasts with nature provides an assessment of the impact of satellite data. G.L.C.

N85-29436*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE IMPACT OF SCATTEROMETER DATA ON LIMITED-AREA MODEL PREDICTIONS OF THE QE 2 STORM Abstract Only

Dean Duffy and R. Atlas *In its* Res. Rev., 1983 Jan. 1985 p 8-9 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Experiments were conducted to assess the impact of SEASAT-A scatterometer (SASS) data on high resolution model predictions of the QE2 storm and to explore different approaches for utilizing SASS data. For all of the experiments, the model used is the limited-area model with a horizontal resolution of 100 km. G.L.C.

N85-29437*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBJECTIVE DETERMINATION OF HEAT WAVE PATTERNS Abstract Only
N. Wolfson and R. Atlas *In its* Res. Rev., 1983 Jan. 1985 p 10-11 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

A simple index was developed in order to objectively characterize a heat wave pattern in either analyses or forecasts of 500 mb height. 500 mb height was chosen because this parameter is usually among the most accurate fields predicted by numerical models. In addition, it is highly correlated with the surface air temperature on many time scales. The heat index IN is designed to be applied to any region of interest and to be used for any objectively analyzed data and specifically those of NWP models. G.L.C.

N85-29438*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELIMINARY RESULTS FROM NUMERICAL EXPERIMENTS ON THE SUMMER 1980 HEAT WAVE AND DROUGHT Abstract Only
N. Wolfson, R. Atlas, and Yogesh C. Sud *In its* Res. Rev., 1983 Jan. 1985 p 14-15 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

During the summer of 1980, a prolonged heat wave and drought affected the United States. A preliminary set of experiments has been conducted to study the effect of varying boundary conditions on the GLA model simulation of the heat wave. Five 10-day numerical integrations with three different specifications of boundary conditions were carried out: a control experiment which utilized climatological boundary conditions, an SST experiment which utilized summer 1980 sea-surface temperatures in the North Pacific, but climatological values elsewhere, and a Soil Moisture experiment which utilized the values of Mintz-Serafini for the summer, 1980. The starting dates for the five forecasts were 11 June, 7 July, 21 July, 22 August, and 6 September of 1980. These dates were specifically chosen as days when a heat wave was already established in order to investigate the effect of soil moistures or North Pacific sea-surface temperatures on the model's ability to maintain the heat wave pattern. The experiments were evaluated in terms of the heat wave index for the South Plains, North Plains, Great Plains and the entire U.S. In addition a subjective comparison of map patterns has been performed. G.L.C.

N85-29439*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
IMPROVED CLOUD AND SURFACE FIELDS DERIVED FROM HIRS2/MSU Abstract Only
Joel Susskind and Dennis Reuter *In its* Res. Rev., 1983 Jan. 1985 p 19-20 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The methods to retrieve cloud parameters from HIRS2/MSU data have been shown to produce qualitatively reasonable cloud fields but to underestimate cloud amount. Improvements have been made to the cloud algorithm which allow for better determination of low clouds. These improvements involve retrieving cloud fields at a higher spatial resolution, which decreases the problems arising from multiple layer clouds, and increasing the number of channels used to determine the cloud parameters from 2 15 microns lower tropospheric sounding channels to 5 channels, including the 11 microns window and 2 15 microns mid and upper tropospheric sounding channels. The use of the 11 microns window channel was very important in identifying low level clouds. G.L.C.

N85-29440*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERCOMPARISON OF SEA-SURFACE TEMPERATURE ANOMALY FIELDS Abstract Only
Joel Susskind and Dennis Reuter *In its* Res. Rev., 1983 Jan. 1985 p 21-23 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Sea-surface temperature anomaly fields produced from analysis of HIRS2/MSU data at GLAS for the months November 1979, December 1981, March 1982, and July 1982 were compared to those produced from data from ships, AVHRR, and SMMR in a series of NASA sponsored sea-surface temperature workshops. The methods used by GLAS to analyze the HIRS2/MSU data were made to the algorithm used to retrieve sea and land surface temperatures and in the cloud filtering algorithm. One of the improvements involved generating weights for a given sounding, which decreased with increasing cloudiness and increasing humidity. These weights should be used in generating monthly mean fields. The workshop generated statistics for the weighted HIRS2/MSU field only for the month of July 1982. G.L.C.

N85-29441*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EXPERIMENTS ON THE ASSIMILATION OF PATCHES OF DATA USING A BAROTROPIC MODEL Abstract Only
Frederick H. M. Semazzi *In its* Res. Rev., 1983 Jan. 1985 p 24-25 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Experiments were performed to examine the impact of adopting various procedures in the assimilation of patches of data during the progress of a numerical forecast. A barotropic model described by Takacs and Balgovind, 1983 is used for the experiments. The model is global and its discretization is similar to the GLA Fourth Order GCM. The effect of orography is included in the model. The experiments are of an identical twin kind. The nature run starts from global fields of wind (u and v) and height (h) at 300 mb. They are real data of January, 1979 OOZ which were interpolated from the adjacent sigma levels of the GLA GCM and then balanced by the bounded derivative method. From this initial state a 6 day forecast is performed. At intervals of 3 hours this information is saved over sectors of 60 width in longitude, from the south pole to the north pole, to simulate data coverage and observational frequency of a polar orbiting satellite. G.L.C.

N85-29442*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH-LATITUDE FILTERING IN A GLOBAL GRID-POINT MODEL USING MODEL NORMAL MODES **c46**
Lawrence L. Takacs, I. M. Navon, and Eugenia Kalnay *In its* Res. Rev., 1983 Jan. 1985 p 26-27 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

The aim of high-latitude filtering in the vicinity of the poles is to avoid the excessively short time steps imposed on an explicit time-differencing scheme by linear stability due to fast moving inertia-gravity waves near the poles. The model normal mode expansion toward the problem of high-latitude filtering in a global shallow water model using the same philosophy as that used by Daley for the problem for large timesteps in P.E. models with explicit time integration schemes was applied. G.L.C.

N85-29443*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE IMPROVEMENT OF SATELLITE TEMPERATURE RETRIEVALS BY MEANS OF BOUNDARY LAYER MODELS Abstract Only
R. Boers *In its* Res. Rev., 1983 Jan. 1985 p 28-30 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The improvement of the accuracy of the satellite temperature retrievals close to the Earth's surface by boundary layer models was determined. The simplest type of boundary layer models that only consider time changes in the mean boundary layer quantities such as equivalent potential temperature and specific humidity, but neglect the details of the turbulent structure in the interior of the layer were used. They can be run with relatively few externally specified parameters: surface wind speed and divergence rate. Model verifications studies show that under certain conditions the mean atmospheric structure can be simulated very well. E.A.K.

N85-29444*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS OF FUZZY CLUSTERING TECHNIQUES TO STRATIFIED BY TROPOPAUSE MSU TEMPERATURE RETRIEVALS Abstract Only
Marie-Jeanne Munteanu and Paul Piraino *In its* Res. Rev., 1983 Jan. 1985 p 31-32 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The fuzzy partitioned clustering method was applied to predict tropopause height only using microwave information with an eye towards using it on real data under cloudy conditions. In the second stage stratified by tropopause regression temperature retrievals included using only the three or four microwave channels for each 40 mb range. The first step in the experiment is the fuzzy partitioned clustering of the microwave brightness temperatures. This method is a combination of standard hard clustering and discriminant analysis. The fuzzy partitioned clustering uses all the generated probabilities of membership of each pattern vector in any of the given clusters. These probabilities are generated by discriminant analysis to locate the correct cluster. The ultimate goal of standard discriminant analysis is to provide the unique (correct) cluster to which the pattern vector belongs. It was only the maximum of all the generated probabilities. The method uses all the probabilities and weight the regressions generated within each cluster. These regression formulas predict the tropopause height from the microwave brightness temperatures. In the second step the microwave regression temperature retrievals are stratified by tropopause height every 40 mb. The control experiment is defined, the data are stratified by land/ocean, summer/winter, and latitude bands. E.A.K.

N85-29445*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS OF FUZZY SET THEORY TO SATELLITE SOUNDINGS
Marie-Jeanne Munteanu *In its* Res. Rev., 1983 Jan. 1985 p 33-37 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The introduction of an appropriate fuzzy setting for satellite soundings and its application to clustering methods via unimodal fuzzy sets in the future is proposed. Methods of hard clustering analysis and fuzzy partitioned clustering were applied on simulated data with very encouraging results. The proposed clustering technique is discussed. The notion of a unimodal fuzzy set was chosen to represent the partition of a data set for two reasons: (1) it detects all the locations in the vector space where highly concentrated clusters of points exist; and (2) the notion is general enough to represent clusters that exhibit quite general distributions of points. The technique detects all of the existing unimodal fuzzy sets and realizes the maximum separation among them. It is economical in memory space and computational time requirements and also detects groups that are fairly generally distributed in the feature space. E.A.K.

N85-29446*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS OF SOME ARTIFICIAL INTELLIGENCE METHODS TO SATELLITE SOUNDINGS Abstract Only
Marie-Jeanne Munteanu and Oleg Jakubowicz *In its* Res. Rev., 1983 Jan. 1985 p 38-39 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Hard clustering of temperature profiles and regression temperature retrievals were used to refine the method using the probabilities of membership of each pattern vector in each of the clusters derived with discriminant analysis. In hard clustering the maximum probability is taken and the corresponding cluster as the correct cluster are considered discarding the rest of the probabilities. In fuzzy partitioned clustering these probabilities are kept and the final regression retrieval is a weighted regression retrieval of several clusters. This method was used in the clustering of brightness temperatures where the purpose was to predict tropopause height. A further refinement is the division of temperature profiles into three major regions for classification purposes. The results are summarized in the tables total r.m.s. errors are displayed. An approach based on fuzzy logic which is intimately related to artificial intelligence methods is recommended. E.A.K.

N85-29447*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A FACTORED IMPLICIT SCHEME FOR NUMERICAL WEATHER PREDICTION WITH SMALL FACTORIZATION ERROR Abstract Only
Jeff M. Augenbaum, S. E. Cohn (New York Univ., N.Y.), and D. Marchesin (Pontifica Univ. Catolica do Rio de Janeiro, Brazil) *In its* Res. Rev., 1983 Jan. 1985 p 43-44 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Numerical results show that, for large time steps, the factorization error can be significant, even for the slowly propagating Rossby modes. A new scheme is formulated based on a more accurate factorization of the equations. By grouping separately the terms of the equations which give rise to the fast and slow motion, the equations are factored more accurately. The fast-slow factorization eliminated the factorization error. If each of the fast and slow factors are factored again according to spatial components, the resulting scheme only involves the solution of one dimensional linear systems, and computational efficient. It is shown that the factorization error for the slow made component is negligible for this new scheme. E.A.K.

N85-29448*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF OPTIMUM INTERPOLATION AND CRESSMAN ANALYSES Abstract Only
Wayman E. Baker, Steve C. Bloom, and Mark S. Nestler (Sigma Data Computing Corp., Rockville, Md.) *In its* Res. Rev., 1983 Jan. 1985 p 45-47 ref Previously announced as N85-14371 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The development of a state of the art optimum interpolation (O/I) objective analysis procedure for use in numerical weather prediction studies was investigated. A three dimensional multivariate O/I analysis scheme was developed. Some characteristics of the GLAS O/I compared with those of the NMC and ECMWF systems are summarized. Some recent enhancements of the GLAS scheme include a univariate analysis of water vapor mixing ratio, a geographically dependent model prediction error correlation function and a multivariate oceanic surface analysis. Author

N85-29449*# Sigma Data Services Corp., Greenbelt, Md.
DERIVATION OF MODEL TOPOGRAPHY Abstract Only
Ramesh C. Balgovind *In* NASA. Goddard Space Flight Center Res. Rev., 1983 Jan. 1985 p 48-49 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The Fourth-Order model necessitates representation of the topography. The problem of the representation of the topography at grid points is addressed. The attempted was to derive an envelope topography. The T1 is obtained by taking local mean plus one standard deviation at each grid point and sigma filtering it. The method was greatly influenced by large standard deviations at steep mountains. The O1 topography is the local mean. The S1 is obtained by Sigma filtering in both latitude and longitude

the mean O1. The S2 is when the operation is applied twice and S3 thrice, the Q3 is the sigma filtered local mean of the upper third quantile of the source data. E.A.K.

N85-29450*# Sigma Data Services Corp., Greenbelt, Md.
SIGMA FILTER Abstract Only
Ramesh C. Balgovind *In* NASA. Goddard Space Flight Center Res. Rev., 1983 Jan. 1985 p 50 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The GLA Fourth-Order model is needed to smooth the topography. This is to remove the Gibbs phenomenon. The Gibbs phenomenon occurs whenever we truncate a Fourier Series. The Sigma factors were introduced to reduce the Gibbs phenomenon. It is found that the smooth Fourier series is nothing but the original Fourier series with its coefficients multiplied by corresponding sigma factors. This operator can be applied many times to obtain high order sigma filtered field and is easily applicable using FFT. It is found that this filter is beneficial in deriving the topography. E.A.K.

N85-29451*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT DEVELOPMENTS IN NONLINEAR NORMAL MODE INITIALIZATION Abstract Only
Steve C. Bloom *In its* Res. Rev., 1983 Jan. 1985 p 51-52 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The importance of a balanced initial condition upon GLAS GCM forecasts and assimilation cycles was assessed. An effort to combine previous work on normal mode initialization at GLA is underway to develop an initialization process for the production version of the GLAS 4th order GCM. The major aspects of this work fall into two parts: vectorization of the linear projector code and the insertion of the mode projector and Machenhauer iteration algorithm into the full GLAS GCM. Memory and paging constraints place restrictions on the number of horizontal modes stored for initialization purposes, and on the manner in which they are stored. Only the first five vertical structures of the gravity modes are used. Differing phase and normalization conventions provided many elusive coding errors. A Machenhauer nonlinear normal mode initialization technique is used. This method entails the insertion of a modified version of the mode projector into the full GCM, and the modification of the GCM to allow for iterative calls to the projector. E.A.K.

N85-29452*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF TWO OROGRAPHICAL DATA SETS FOR THE GLAS FOURTH ORDER GCM Abstract Only
H. Mark Helfand, Ramesh C. Balgovind (Sigma Data Services Corp., Greenbelt, Md.), Ron Dlouhy (Sigma Data Computing Corp., Rockville, Md.), and Jim Pfaendtner *In its* Res. Rev., 1983 Jan. 1985 p 53-54 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The development of a 2 deg latitude by 2.5 deg longitude version of the GLAS Fourth Order General Circulation Model has necessitated the specification of a correspondingly fine horizontal resolution orographic data set to act as a lower boundary condition for the GCM. The S1 topography attempts to relate the mean areally averaged height of such terrain while the Q3 topography emphasizes the effect of the flow of the tallest peaks in such regions by specifying an exaggerated significant height. In order to assess the relative merits of these two orographic data sets. A series of tests was initiated to evaluate the comparative weather forecasting and climate simulation skills of the GLAS Fourth Order GCM when the S1 and Q3 topographies are applied to the lower boundary. Three sets of Northern Hemispheric winter forecasts at the 2 deg x 2.5 deg resolution indicate that the Q3 topography gives slightly better results over the Northern Hemisphere than does the S1 topography. It is apparent that more forecasts will be necessary at both horizontal resolutions before any definitive conclusions are made regarding the choice of an optimal orographic data set. E.A.K.

N85-29453*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DEVELOPMENT AND TESTING OF THE VARIABLE VERTICAL RESOLUTION FOURTH ORDER GCM Abstract Only
H. Mark Helfand, Ron Dlouhy (Sigma Data Computing Corp., Rockville, Md.), Jim Pfaendtner, and Lawrence L. Takacs *In its* Res. Rev., 1983 Jan. 1985 p 55-57 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The vertical coordinate of the Fourth Order Model has been generalized so that the model can now run with an arbitrary number of vertical layers and so that the thicknesses of these layers can be arbitrarily specified (in the sigma coordinate). This Variable Vertical Resolution (VVR) version of the Fourth Order Model will soon replace the current production model. To assess the skill of the VVR model, it has been run with 9 equally spaced layers and compared with the current production model. In two Northern Hemispheric winter cases and one summer case, the two models were virtually identical in forecast skill for 6 to 7 days. After that the VVR model was slightly better in the winter cases and the production model was slightly better in the summer case. The only exception to this was that after 2 days the production model gave slightly more skillful 500 mb forecasts in the tropics for the summer case. B.W.

N85-29454*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PARAMETERIZATION OF SURFACE FLUXES IN THE VVR FOURTH ORDER GCM Abstract Only
H. Mark Helfand *In its* Res. Rev., 1983 Jan. 1985 p 58-60 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The Variable Vertical Resolution (VVR) option of the GLAS Fourth Order General Circulation Model (GCM) allows one to enhance the vertical resolution of the region of the atmosphere adjacent to the Earth's surface. This, in turn, makes it possible to compute turbulent surface fluxes of heat, momentum and moisture directly from the prognosticated properties of the lowest model layer by use of the Monin-Obukhov surface layer similarity theory. The similarity theory applies formally only to the constant flux surface layer which is but a few tens of meters deep. It is not practically feasible to work with a lowest GCM layer thin enough to satisfy these formal constraints. It is shown that at least under conditions of neutral stratification, the similarity theory can be extended beyond its formal limits. The theory still gives reasonable looking results, when the distance from the ground becomes as large as 150 m. It is not infeasible to run the VVR model with a lowest layer thickness on the order of 300 m (the center of the layer would then be 150 m above the Earth's surface), and so if one can prescribe similarity functions phi sub m (zeta) and phi sub h (zeta) to adequately describe the entire extended surface layer, the problem of surface flux parameterization is solved. B.W.

N85-29455*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECIFICATION OF SURFACE ROUGHNESS OVER OCEANS IN THE GLAS FOURTH ORDER GCM Abstract Only **c48**
H. Mark Helfand *In its* Res. Rev., 1983 Jan. 1985 p 61-62 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 08C

The surface roughness height z sub 0 is a parameter which measures the effect of surface irregularities on the mean profiles which occur in the atmospheric surface layer. Over land surfaces, z sub 0 is a function of soil composition, plant canopy type and distribution and other factors such as buildings and structures. Over open water, z sub 0 depends only on the distribution of waves, wavelets and other surface irregularities. These, in turn, are thought to be determined by the mean wind within the surface layer. Large and Pond have derived an empirical relationship between the mean wind speed U sub 10 at the ten meter level over open water and the neutral drag coefficient C sub DN. Their relationship covers the range U sub 10 > or = M/S. Earlier, Kondo had computed a relationship between U sub 10 and C sub

DN on the basis of laboratory observations which extended down to the range of infinitely small wind speeds. An interpretation between the relationships of Large and Pond for large wind speed and of Kondo for small wind speed is presented. B.W.

N85-29456*# Sigma Data Computing Corp., Rockville, Md.
DEVELOPEMENT OF AN OPTIMUM INTERPOLATION ANALYSIS METHOD FOR THE CYBER 205 Abstract Only
Mark S. Nestler, Jack Woollen, and Y. Brin *In* NASA. Goddard Space Flight CenterRes. Rev., 1983 Jan. 1985 p 63-64 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

A state-of-the-art technique to assimilate the diverse observational database obtained during FGGE, and thus create initial conditions for numerical forecasts is described. The GLA optimum interpolation (OI) analysis method analyzes pressure, winds, and temperature at sea level, mixing ratio at six mandatory pressure levels up to 300 mb, and heights and winds at twelve levels up to 50 mb. Conversion to the CYBER 205 required a major re-write of the Amdahl OI code to take advantage of the CYBER vector processing capabilities. Structured programming methods were used to write the programs and this has resulted in a modular, understandable code. Among the contributors to the increased speed of the CYBER code are a vectorized covariance-calculation routine, an extremely fast matrix equation solver, and an innovative data search and sort technique. B.W.

N85-29457*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MODEL DEVELOPMENT HIGHLIGHT FOR 1984: THE GLA FOURTH ORDER GCM Abstract Only
Jim Pfaendtner *In its* Res. Rev., 1983 Jan. 1985 p 65-66 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

A number of improvements have been made to the GLA Fourth Order General Circulation Model and its associated run procedures during the past year. Major development efforts have been carried out in the following areas: (1) model resolution; (2) boundary fields and topography; (3) post-processing of model results on CYBER computer; and (4) model source code. B.W.

N85-29458*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESPONSE OF WINTER FORECASTS MADE WITH THE GLA FOURTH ORDER GCM TO CHANGES IN THE HORIZONTAL GRID RESOLUTION Abstract Only
Jim Pfaendtner *In its* Res. Rev., 1983 Jan. 1985 p 67-69 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The GLA Fourth Order General Circulation Model was modified in 1984 to allow it to be run at a finer horizontal grid resolution. Previously the standard model versions integrated the primitive equations on a 4 degree latitude by 5 degree longitude grid. Forecasts made at this resolution are compared to others which were made using the finer 2 degree latitude by 2 1/2 degree longitude grid resolution. Three winter cases are included with initial conditions from 15 December 1978, 5 January 1979 and 21 January 1979. The 21 January 1979 initial conditions were taken from a GLAS analysis (experiment 2728) which incorporated the GLAS temperature retrievals. The other two cases used European Center Analysis for initial conditions. The forecasts were all verified against European Center Analysis. B.W.

N85-29459*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISON OF FORECAST AND OBSERVED ENERGETICS Abstract Only c46
Wayman E. Baker and Yevgenia Brin (Sigma Data Services Corp., Greenbelt, Md.) *In its* Res. Rev., 1983 Jan. 1985 p 73-76 ref Previously announced as N85-14389 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01

An energetics analysis scheme was developed to compare the observed kinetic energy balance over North America with that derived from forecast cyclone case. It is found that: (1) the observed and predicted kinetic energy and eddy conversion are in good qualitative agreement, although the model eddy conversion tends to be 2 to 3 times stronger than the observed values. The eddy conversion which is stronger in the 12 h forecast than in observations and may be due to several factors is studied; (2) vertical profiles of kinetic energy generation and dissipation exhibit lower and upper tropospheric maxima in both the forecast and observations; and (3) a lag in the observational analysis with the maximum in the observed kinetic energy occurring at 0000 GMT 14 January over the same region as the maximum Eddy conversion 12 h earlier is noted. E.A.K. (IAA)

N85-29460*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ERROR GROWTH IN OPERATIONAL 10-DAY FORECASTS Abstract Only
Eugenia Kalnay and Amnon Dalcher (M/A-COM Sigma Data, Inc., Greenbelt, Md.) *In its* Res. Rev., 1983 Jan. 1985 p 77-79 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The rate of growth of forecast errors has been estimated previously, using as data base 100 consecutive 10-day operational forecasts from the European Center for Medium Range Forecasting (ECMWF). The growth of the difference between two model forecasts verifying the same day was parameterized. This parameterization of error growth was extended by including the effect of model deficiencies as well as their scale dependence. In this way the forecaster are able to fit real forecast error growth and determine the scale dependence of the derived parameters (rate of error growth, external error source due to model errors, and saturation levels). This work is a necessary step in the application of the Lagged Average Forecasting (LAF) technique to the ECMWF 10-day forecasts. It is found that for both the analyses and the forecasts, there is an approximate equipartition of energy between all the zonal wavenumbers m corresponding to the same total wavenumber n. B.W.

N85-29461*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MECHANISTIC EXPERIMENTS TO DETERMINE THE ORIGIN OF SOUTHERN HEMISPHERE STATIONARY WAVES Abstract Only
Eugenia Kalnay and Kingtse C. Mo (M/A-COM Sigma Data, Inc., Greenbelt, Md.) *In its* Res. Rev., 1983 Jan. 1985 p 80-81 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Large amplitude stationary Rossby waves were discovered with zonal wavenumbers of approx. 7 between 20 S and 40 S over and in the lee of South America. These waves, present during January 1979, disappeared in February, 1979. It was concluded that the waves were not orographically forced because they corresponded to a ridge in the lee of the Andes, and were not forced by observed sea surface temperature anomalies because of their space and time phase relationship. Two 15 day forecast experiments were performed with the GLAS Fourth Order General Circulation Model, and initial conditions corresponding to 5 January and 4 February, 1979. These forecasts reproduce reasonably well the presence of the January wave and their absence in February. Several mechanistic experiments to determine the origin of the waves were also performed. A No Andes forecast shows that the waves do indeed exist independently of orographic forcing. Several experiments modifying the coefficient of latent heat lead to the conclusion that tropical heating is important in the maintenance of the waves. B.W.

N85-29462*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENERGY SOURCES OF THE DOMINANT FREQUENCY DEPENDENT 3-DIMENSIONAL ATMOSPHERIC MODES Abstract Only
Siegfried Schubert *In its* Res. Rev., 1983 Jan. 1985 p 82-83

ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The energy sources and sinks associated with the zonally asymmetric winter mean flow are investigated as part of an on-going study of atmospheric variability. Distinctly different horizontal structures for the long, intermediate and short time scale atmospheric variations were noted. In previous observations, the 3-dimensional structure of the fluctuations is investigated and the relative roles of barotropic and baroclinic terms are assessed.
B.W.

N85-29463*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPARISON OF THE BOUNDED DERIVATIVE AND THE NORMAL MODE INITIALIZATION METHODS USING REAL DATA Abstract Only
Frederick H. M. Semazzi and I. M. Navon *In its* Res. Rev., 1983 Jan. 1985 p 84-85 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Browning et al. (1980) proposed an initialization method called the bounded derivative method (BDI). They used analytical data to test the new method. Kasahara (1982) theoretically demonstrated the equivalence between BDI and the well known nonlinear normal mode initialization method (NMI). The purposes of this study are the extension of the application of BDI to real data and comparison with NMI. The unbalanced initial state (UBD) is data of January, 1979 OOZ which were interpolated from the adjacent sigma levels of the GLAS GCM to the 300 mb surface. The global barotropic model described by Takacs and Balgovind (1983) is used. Orographic forcing is explicitly included in the model. Many comparisons are performed between various quantities. However, we only present a comparison of the time evolution at two grid points A(50 S, 90 E) and B(10 S, 20 E) which represent low and middle latitude locations. To facilitate a more complete comparison an initialization experiment based on the classical balance equation (CBE) was also included. Author

N85-29464*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE VERTICAL STRUCTURE OF GLOBAL ROTATIONAL NORMAL MODES Abstract Only **c46**
David M. Straus *In its* Res. Rev., 1983 Jan. 1985 p 86-87 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

In a recent study, Lindzen et al. (1984) examined the amplitude and phase evolution of Hough mode projections at 500 mb. The Hough modes represent the simplest normal mode approximation available, and correspond to the neutral eigenfunctions of a shallow water fluid with no mean zonal flow. It was found that when the observed amplitude of a rotational Hough mode was large, it tended to propagate at the phase speed of a normal mode in the presence of mean 500 mb winds, giving a strong indication that normal modes are of relevance to the atmosphere. The vertical structure of the approximately defined rotational normal modes were explored by projecting observed data onto Hough functions at levels other than 500 mb. The stationary and eastward propagating components were filtered out at each level. The evolution of the amplitude in time throughout the troposphere is given for several modes during summer and winter. Author

N85-29465*# M/A-COM Sigma Data, Inc., Greenbelt, Md.
QUASI STATIONARY STATES IN THE SOUTHERN HEMISPHERE Abstract Only
Kingtse C. Mo *In* NASA. Goddard Space Flight Center Res. Rev., 1983 Jan. 1985 p 91-92 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Pattern correlations between daily anomalies (Horel 1984) were used to study the persistency of the Southern Hemisphere circulations. The data set consists of the daily Australian analyses of 500 mb heights and sea level pressure for the period from 1972 and 1983. Compared to the Northern Hemisphere, the pattern correlations are much smaller and more variable in the Southern Hemisphere. The mean one day lag is only 0.57, (0.82 for the NH). The correlations increase significantly for the filtered anomalies which consist of the long planetary waves from 0 to 4. Subjective criteria based on the pattern correlations are used to select the quasi stationary events. A series of 5 or more daily maps is quasi stationary if the pattern correlations between all consecutive pairs of maps in this time series are larger or equal to 0.5. Author

N85-29466*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRENDS IN THE SOUTHERN HEMISPHERE Abstract Only
Kingtse C. Mo (M/A-COM Sigma Data, Inc., Greenbelt, Md.) and Harry vanLoon *In its* Res. Rev., 1983 Jan. 1985 p 93-95 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The station data of monthly mean sea level pressure, surface air temperature as well as monthly mean upper air rawinsonde observations were used to study the trends in the southern winter (June, July and August) and summer (December, January and February). This study covers the period 1951 to 1981. Most of the surface data have continuous 31 year records, however, for some high latitude stations, both surface and upper air records started in 1957 or even later. The normalized anomaly for a given variable Z is defined as the departure from the 1951 to 1981 grand mean divided by the standard deviation during the same period. To eliminate the large fluctuations in the data, the 1-3-1 smoothing was applied to the time series of normalized anomalies. The trends of monthly mean temperatures and height from the surface to 200 mb level is documented. Author

N85-29467*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SEASONAL CYCLE OF STORMINESS AS MEASURED BY BAND-PASS FLUCTUATIONS Abstract Only
David M. Straus *In its* Res. Rev., 1983 Jan. 1985 p 96-97 ref (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

A sample of statistics, namely the seasonal cycle of baroclinic storms, as represented by bandpass filtered geopotential height variances at 850 mb is presented. The particular filter used is that suggested by Blackmon and White (1982), and retains periods of approximately 2.5 to 10 days. The time series of height (at each grid point) were filtered by removing the annual and semiannual cycles for that point, and by removing zonal wavenumbers higher than 20. The bandpass filter was then applied. The height variances of the filtered fields were then computed for each winter season, each spring, each summer season, and each fall season. These variances were then averaged by season. Maps of the standard deviation are shown. Figures show clearly the seasonal cycle of bandpass fluctuations. The major seasonal variation is seen to consist mostly of a summertime weakening and shift; spring and fall appear nearly identical to winter. The corresponding results at 500 mb are similar, but with the stormtrack variance being slightly larger in spring and fall compared to winter. Author

N85-29468*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CONTRASTING NORTHERN HEMISPHERE WINTERS OF 1980-81 AND 1981-82 Abstract Only
Glenn H. White *In its* Res. Rev., 1983 Jan. 1985 p 98-99 refs Previously announced as N84-22087 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Seasonal statistics calculated from daily operational analyses by the European Center for Medium Range Weather Forecasts for December 1980 to February 1981 (season 1) and December 1981 to February 1982 (season 2) were used to contrast the two seasonal mean circulation patterns present in the Northern Hemisphere and to investigate possible causes for the differences. The vertically averaged seasonal mean zonal wind and

E-vector, a measure of the anisotropy of the transient eddies over the Pacific is shown for season 1 and season 2. The pattern in season 2, but not season 1, resembles that found in a modeling study of barotropic instability. One possible explanation for the differences between season 1 and 2 is a weak change in tropical heating associated with the southern oscillation, the effect of which in midlatitude was amplified by the occurrence of barotropic instability over the Pacific in season 2, but not season 1. E.A.K.

N85-29469*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE GLOBAL DISTRIBUTION OF THREE-DIMENSIONAL ELIASSEN-PALM FLUXES BY STATIONARY WAVES Abstract Only **c46**
Glenn H. White *In its* Res. Rev., 1983 Jan. 1985 p 100-102 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

The global distribution of three dimensional EP fluxes is investigated by using statistics for Dec. 1980 to Feb. 1981 and June to August 1981 calculated from operational analyses. Results at 1000 and 150 mb are given. During the Northern Hemisphere (NH) winter strong upward fluxes can be seen at 1000 mb in the lee of the Himalayas and Rockies, windward of the Canadian Rockies in the east Pacific, to the north of the Atlantic stormtrack and over the west Pacific in a region of strong land sea thermal contrast. Upward fluxes also appear near the west coasts of the Southern Hemisphere (SH) subtropical continents regions of strong land sea thermal contrast. At 150 mb (Fig. 1b) the strongest upward flux now occurs south of Alaska. The horizontal fluxes imply poleward propagation from the convection over Indonesia to 20 N, a region where the assumptions underlying EP fluxes are not well met. Equatorward propagation dominates the NH midlatitude except over the Pacific. The fluxes given offer hints of the sources of stationary waves, but also show several puzzling features and a rather cavalier disregard of regions of easterly wind. The physical meaning and interpretation of three dimensional EP fluxes is not yet clear. Author

N85-29470*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSIENT EDDIES IN THE UCLA GCM Abstract Only **c46**
Glenn H. White *In its* Res. Rev., 1983 Jan. 1985 p 103-104 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

The simulation of transient eddies in the nine level UCLA general circulation model (GCM) was examined and compared to observations, with emphasis on the Northern Hemisphere winter. Qualitatively, the UCLA GCM reproduces many features of the observed circulation and the relationship between the time mean flow and transient eddies; however, the magnitudes of transient eddies in the UCLA GCM, particularly at frequencies lower than those associated with baroclinic instability, appear to be much less than those observed. The pattern of low level transient eddy heat fluxes were similar to observations and acted to dissipate the low level seasonal mean temperature field. The simulated transient eddy kinetic energy at 300 mb is given for eddies of all time scales shorter than a season. Author

N85-29471*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON FOFONOFF'S MODE Abstract Only **c48**
Lee-Or Merkine (Technion - Israel Inst. of Tech.), Kingtse C. Mo (M/A-COM Sigma Data, Inc., Greenbelt, Md.), and Eugenia Kalnay *In its* Res. Rev., 1983 Jan. 1985 p 107-108 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 08C

The classical barotropic ocean model of Veronis (1966) is reexamined to verify the possible existence of Fofonoff's (1954) steady free inertial mode by considering the balance where J is the Jacobian, eta is the streamfunction of the horizontal velocity, and R is a parameter of nonlinearity. A linear functional relationship between the potential vorticity and the streamfunction and inertial boundary layers along the ocean basin was suggested by Fofonoff. However, the numerical integration showed that the system is barotropically unstable. The typical instantaneous field is given. The statistical equilibrium state eta is also given. Although it resembles Fofonoff's solution, it is maintained by the Reynolds stress field induced by the eddies in addition to the wind stress and dissipation. The plot of eta versus R delta sq +y is given. It is shown that the Fofonoff's linear relation between the potential vorticity and the streamfunction does not hold uniformly over the entire basin. The above results show that the Fofonoff's solution can not be realized physically. Author

N85-29472*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSIS OF A SIMULATED CLOUD CLIMATOLOGY Abstract Only
Dave Randall, Harshvardhan, D. Short, and Tom Corsetti *In its* Res. Rev., 1983 Jan. 1985 p 109-110 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Cloudiness simulations with the UCLA/Goddard general circulation model were analyzed by comparison of simulated and radiation statistics with corresponding observations. A description of the model formulation is given by Suarez et al. (1983), and some results are discussed by Randall et al. (1985). The global mean cloudiness is near 50%, in agreement with observations. However, comparison with the satellite observations of Susskind et al. (1983) shows that the model produces too many low level clouds at high latitudes and too few high clouds in the tropics. The simulated outgoing longwave radiation at the top of the atmosphere is too low in middle and high latitudes, and much too high in regions of deep convection. The most serious deficiency of the current model's cloudiness simulation is its gross underprediction of the cirrus cloudiness associated with deep convection. Author

N85-29473*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MOIST AVAILABLE ENERGY OF A CONDITIONALLY UNSTABLE ATMOSPHERE Abstract Only
Dave Randall and Tom Corsetti *In its* Res. Rev., 1983 Jan. 1985 p 111-112 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Two simple methods for computing the moist available energy for cases in which the total number of parcels is fairly small are discussed. The first is a swapping routine that finds the reference state by exchanging parcels whenever the swap reduces the total enthalpy. However, it can be proved by contrived example that the swapping algorithm does not always find the true reference state. A second brute force routine actually examines all possible arrangements of the parcels and chooses the one with the smallest moist enthalpy. At present, both routines allow only horizontally homogeneous reference states. In an exploratory study, the swapping routine was used to find MAE and reference state for a time sequence of GATE soundings, all of which are conditionally unstable. In spot checks, the brute force routine always agreed with the swapper. Results show that in passing from the given state of the reference state the lowest three hundred mb of the atmosphere typically exchanges places with the 300 mb above it. The reference state then contains a dry warm layer near the surface, but a supersaturated but cool layer in the middle troposphere. The upper portion of the sounding is not modified in passing from the given state to the reference state. R.J.F.

N85-29474*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRELIMINARY GCM RESULTS WITH A NEW RADIATION PARAMETERIZATION Abstract Only **c46**
Dave Randall, Harshvardhan, R. Davies, and Tom Corsetti *In its* Res. Rev., 1983 Jan. 1985 p 113-114 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

A new parameterization of solar and terrestrial radiation was

developed and tested. The solar radiation parameterization is based on that of Lacis and Hansen (1974), but with zenith-angle-dependent surface albedoes, and revised treatments of cloudiness. The terrestrial radiation parameterization is based on the work of Chou (1984) for water vapor, Chou and Peng (1983) for carbon dioxide, and Rogers (1968) for ozone, with a new parameterization of the effects of clouds. Results obtained were compared with the new parameterizations to those obtained with the earlier parameterization described by Schlessinger (1976). Several dramatic improvements came to light. For the most part these are related to the fact that the new terrestrial radiation paramerization includes the effects of the water vapor continuum, while the earlier parameterization does not. In the moist tropical planetary boundary layer (PBL) continuum emission leads to much stronger cooling of the PBL over the oceans. Over land, however, the cooling of the PBL is significantly reduced. The latter, somewhat paradoxical result is due to the strong diurnal cycle of the continental PBL. At night the shallow continental PBL is overlain by a moist layer created by mixing during the previous afternoon. The moist upper layer acts as a radiative blanket, reducing the time-averaged radiative cooling of the continental PBL. R.J.F.

N85-29475*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTIPLE EQUILIBRIA OF THE BAROTROPIC VORTICITY EQUATION ON A SPHERE Abstract Only **c46**
Max J. Suarez *In its* Res. Rev., 1983 Jan. 1985 p 115-119 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

Multiple states of the barotropic vorticity equation in which the balance is between the first and third terms on the r.h.s. of (1) are given. Solutions of this type were also considered by Charney and Devore (1979) in their discussion of thermally, rather than topographically, forced waves. Whereas in the case of topographic forcing the multiplicity arises from what they called form-drag instability in the wave-zonal flow interaction, in the thermal forcing case the associated instability appears to be the Rossby-wave instability discussed by Lorenz (1972), and the multiple states of the highly truncated model proved to be unstable when more degrees of freedom were added. The multiple statistically steady solutions described are thus novel in that they do not involve form-drag instability, they have stable statistics in calculations with a large number of degrees of freedoms, and they occur on the sphere, with no artificial confinement in a resonant cavity. Furthermore, the solutions are obtained with no external forcing of the zonal flow. The full non-linear equations for two-dimensional non-divergent motion between smooth, rigid boundaries on a sphere were used. R.J.F.

N85-29476*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW CO2 TRANSMITTANCE PARAMETERIZATION AND ITS IMPACT ON THE GLA GCM Abstract Only **c46**
Richard Wobus, M.-L. C. Wui, and Joel Susskind *In its* Res. Rev., 1983 Jan. 1985 p 120-121 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

The Wu-Kaplan radiation parameterization (Krishnamurthy, 1982) used in the GLA Global Circulation Model (GCM) was improved by replacing its fixed tables of CO2 transmittance in the 15 micron band with models developed by regression on line-by-line transmittances. The transmittances between layers are modeled as products of effective sublayer transmittances. The GLA GCM was integrated for 20 days starting at OZ, January 21, 1979, using the transmittance model. In the control run the fixed table of 15 micron CO2 transmittances is used. The effect of the change of initial cooling rate is illustrated by a map of the difference of 50 mb temperature after 6 hours. The cooling is reduced over high topography, where the fixed table underestimates the transmittance, and is reduced slightly throughout the tropics and the north polar area where the stratosphere is relatively cold. Over elevated topography the surface cooling increases, also as expected. The stratospheric temperature increases over a degree in the arctic and smaller amounts over Antarctica and elsewhere. Tropospheric equilibrium temperature response is obscured by time dependent differences in synoptic disturbances. R.J.F.

N85-29477*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A GCM STUDY OF THE ATMOSPHERIC RESPONSE TO TROPICAL SST ANOMALIES Abstract Only
Max J. Suarez *In its* Res. Rev., 1983 Jan. 1985 p 125-126 (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

The purpose is to understand the evolution of the atmospheric anomalies associated with the most recent warm episode by the use of simulation studies with the UCLA general circulation model (GCM). The approach is to integrate the model using the observed sequence of Sea Surface Temperature (SST) anomalies during 1982 to 1983, and compare it with a control run in which all boundary conditions vary from month to month as in the climatology. The control for the experiment was a three year simulation using seasonally varying climatological SSTs. The anomaly calculation was initialized from 15 June of the first year of the control. From 15 June to 1 July, the SST was gradually modified by the anomalies observed during June and July of 1982. From 1 July on, the run was continued using the control's SST plus the 1982 to 1983 anomalies. SSTs were varied daily, interpolating between monthly means. This second integration as carried to the end of February of the second year (1983 in the anomaly). Only anomalies over the tropical Pacific were used. R.J.F.

N85-29478*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFLUENCE OF LAND SURFACE PROCESSES ON THE INDIAN MONSOON: A NUMERICAL STUDY Abstract Only
Yogesh C. Sud and William E. Smith *In its* Res. Rev., 1983 Jan. 1985 p 127-128 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04B

Twelve July integrations are made with the Goddard Laboratory for Atmospheres' Global Circulation Model GLAS GCM to investigate the influence of local changes in the land surface fluxes, that may be produced by changes in the land surface vegetation, on the monsoon circulation and rainfall over the Indian subcontinent. The study consists of an ensemble mean of three integrations each for four separate cases: (1) control integrations with normaly prescribed boundary conditions, called C; (2) three other integrations with the surface albedo increased (from 0.14 to 0.20) on the Indian subcontinent, called E sub 1; (3) another set of three integrations with the surface albedo increased as above together with a decrease of surface roughness (from 45 cm to 0.02 cm), called E sub 2; and (4) a last set of three integrations with higher surface albedo and low surface roughness as above, but with no evapotranspiration, called E sub 3. Except for these changes in the anomaly region (delimited by solid line) all other boundary conditions were prescribed. Consequently, their time evaluation is unaffected by the Earth-atmosphere interactions. R.J.F.

N85-29479*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFLUENCE OF LAND-SURFACE ROUGHNESS ON ATMOSPHERIC CIRCULATION AND RAINFALL: A SENSITIVITY STUDY WITH A GCM Abstract Only **c46**
Yogesh C. Sud, J. Shukla, and Yale Mintz (Maryland Univ., College Park) *In its* Res. Rev., 1983 Jan. 1985 p 129-130 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 04A

The sensitivity of atmospheric circulation to the surface roughness of land was studied. The study suggests that land-surface roughness is an important parameter. It is concluded that future simulations of weather and climate should be made with global circulation models that include a suitable parameterization of the vegetation on land. R.J.F.

N85-29480*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. Geophysical Fluid Dynamics Lab.

THE STRUCTURE AND DYNAMICS OF AN OBSERVED MOIST FRONT Abstract Only

I. Orlanski *In its* Res. Rev., 1983 Jan. 1985 p 133-135 (For primary document see N85-29433 18-47)

Avail: NTIS HC A08/MF A01 CSCL 04B

The structure and dynamics of the moist cold front of 25 and 26 April 1979, the third observing day of the Severe Environmental Storms and Mesoscale experiment (SESAME), are investigated through the use of a three-dimensional mesoscale numerical model. This work is one of the first studies in which model results are compared, in a one-to-one manner, with a detailed observational analysis, namely that of Ogura and Portis (1982) as taken from the SESAME observations. In addition, frontogenetical effects, both adiabatic and diabatic, are studied on a vertical cross-section through the front; similarities and differences with the adiabatic analysis of Ogura and Portis are discussed. Many similarities exist between the modeled and analyzed fields, although the analysis tends to have weaker horizontal gradients due to the coarseness of the observational network. Vorticity and convergence near the surface were found to have the same magnitude in both the model solution and the analysis, in contrast to idealized frontogenesis models which predict vorticity to be much larger than convergence. R.J.F.

N85-29481*# European Centre for Medium-Range Weather Forecasts, Reading (England).

SOME RECENT DEVELOPMENTS IN NUMERICAL MODELLING AT ECMWF Abstract Only

A. J. Simmons *In* NASA. Goddard Space Flight Center Res. Rev., 1983 Jan. 1985 p 136-139 (For primary document see N85-29433 18-47)

Avail: NTIS HC A08/MF A01 CSCL 04B

A new atmospheric model was introduced into operational forecasting at the European Center for Medium Range Weather Forecasts, on 21 April 1983. The principal differences between this model and the Center's first operational model were in the adiabatic formulation, which, in the new model, includes use of a spectral representation in the horizontal, a more general vertical coordinate, and a modified, more-efficient, time-stepping scheme. In addition, new programming techniques and standards were adopted to facilitate both the model's use as a research tool and its adaptation to make full use of the features of the recently-acquired CRAY X-MP computer. A number of revisions were also made in detailed aspects of the formulation of the parameterization schemes. The operational change to this new model was accompanied by a second important change, namely the use of a higher envelope orography in the lower boundary conditions of the model. Problems in the operational performance of the model and development preparatory to the future operational implementation of a high resolution version of the model on the CRAY X-MP are discussed. R.J.F.

N85-29482*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LARGE-EDDY SIMULATION IN PLANETARY BOUNDARY-LAYER RESEARCH Abstract Only **c46**

J. C. Wyngaard *In* NASA. Goddard Space Flight Center Res. Rev., 1983 Jan. 1985 p 140-141 refs (For primary document see N85-29433 18-47)

Avail: NTIS HC A08/MF A01 CSCL 04A

The structure and dynamics of the convective boundary layer are discussed. The vertical transport of a conservative, passive scalar was simulated. Also studied were the statistics by top-down and bottom-up scalar fields. Substantial differences were found between them due, presumably, to the asymmetry in the convective boundary layer. A generalization of mixed-layer scaling was developed which allows one to include the effects of top-down diffusion. R.J.F.

N85-29483# Cologne Univ. (West Germany).

HELLMUT BERG ISSUE [HELLMUT-BERG-HEFT]

A. Ebel, ed., F. M. Neubauer, ed., E. Raschke, ed., and P. Speath 1984 105 p refs In GERMAN Presented at Colloq., Cologne, 4 Nov. 1984

(MITT-39; ISSN-0069-5882) Avail: NTIS HC A06/MF A01

Numerical meteorology, cloud physics, and applied climatology are reviewed. The study of urban climates and air hygiene is reviewed. Progress in radar meteorology since the beginning of the sixties is presented. Diffusion of trace gases in the ground level boundary layer, and photochemical processes in the lower stratosphere (ozone layer) are discussed. The circulation and transport of energy in angular momentum in the troposphere, lower stratosphere, mesosphere, and lower thermosphere are treated. For individual titles, see N85-29484 through N85-29492.

N85-29484# Cologne Univ. (West Germany).

NUMERICAL METEOROLOGY [NUMERISCHE METEOROLOGIE]

H. Lieth *In its* Hellmut Berg Issue 1984 p 14-22 In GERMAN (For primary document see N85-29483 18-47)

Avail: NTIS HC A06/MF A01

The progress in numerical meteorology for daily weather forecasting since the beginning of the sixties is discussed. In 1960 only three-dimensional baroclinic models were used in the routine forecasting of the Joint Numerical Weather Prediction Unit. The numerical solution of the filtered equations is very complicated. Therefore the conversion of the models to the presently generally applied primitive equation was an essential step forward. In 1966 routine numerical weather forecasting started in Germany using a grid point model. This model was improved by reducing the mesh grid and completing the physical content; the orographic aspect is still insufficient. The problem of the enormous increase of calculation time by reducing the mesh grid is partly avoided by increasing the resolution only in small, especially interesting domains. Author (ESA)

N85-29485# Cologne Univ. (West Germany).

CLOUD PHYSICS [WOLKENPHYSIK]

M. Laube *In its* Hellmut Berg Issue 1984 p 23-40 refs In GERMAN (For primary document see N85-29483 18-47)

Avail: NTIS HC A06/MF A01

Fundamental cloud physics processes, measurements inside and in the neighborhood of clouds, laboratory experiments, and numerical model calculations are described. The formation of precipitation and the interaction between the processes are presented. The physical processes in which aerosol particles are involved as cloud condensation nuclei are described. The formation process of cloud and rain droplets is explained. The formation of natural ice and snow crystals, and hail is described. The three types of precipitation process via the ice phase are presented. Electrical cloud events are treated. The development of instrumental techniques for the investigation of microphysical and dynamic phenomena in a cloud is discussed. Author (ESA)

N85-29486# Cologne Univ. (West Germany).

APPLIED CLIMATOLOGY [ANGEWANDTE KLIMATOLOGIE]

W. Terpitz *In its* Hellmut Berg Issue 1984 p 41-53 refs In GERMAN (For primary document see N85-29483 18-47)

Avail: NTIS HC A06/MF A01

Applications of climatology to improve the quality of life are discussed. The working and investigation methods of the German weather service are described. Planning advice for roads concerning weather effects and ecological problems is given.

Author (ESA)

N85-29487# Technische Hochschule, Aachen (West Germany).

URBAN CLIMATE AND AIR HYGIENE BEFORE, DURING, AND AFTER THE LIFEWORK OF HELLMUT BERG. OVERVIEW OF A BRANCH OF APPLIED METEOROLOGY [STADTKLIMA UND LUFTHYGIENE VOR, WAEHREND UND NACH DEM LEBENSWERK VON HELLMUT BERG, UEBERBLICK ZU EINEM ZWEIG DER ANGEWANDTEN METEOROLOGIE]

H. Emonds *In its* Hellmut Berg Issue 1984 p 54-62 refs In GERMAN (For primary document see N85-29483 18-47)
Avail: NTIS HC A06/MF A01

The history of the study of urban climates is presented. Between 1930 and 1960 urban climatology was developed as an independent branch of science. Six working methods, partially deduced from macro and microclimatology are depicted. The measuring quantities are radiation, temperature, humidity, wind direction, wind velocity, and a number of air pollutants. The methods are deductive and prove especially fruitful in urban boundary layer meteorology, air hygiene, and urban planning. Author (ESA)

N85-29488# Technische Hochschule, Aachen (West Germany).
PROGRESS IN RADAR METEOROLOGY [FORTSCHRITTE DER RADARMETEOROLOGIE]
L. J. Breuer *In its* Hellmut Berg Issue 1984 p 63-73 refs In GERMAN (For primary document see N85-29483 18-47)
Avail: NTIS HC A06/MF A01

Radar meteorology in precipitation location and rain measurement is reviewed. An historical review of the developments before 1960 is given. Radar data processing, peripheral instrumentation, and measuring techniques are explained. Peripheral instruments improve knowledge of rain intensity and droplet distribution structures with which theoretical considerations can be checked. Wavelength choice and application domain of weather radars are discussed. Author (ESA)

N85-29489# Technische Hochschule, Aachen (West Germany).
DIFFUSION OF TRACE GASES IN THE GROUND LEVEL BOUNDARY LAYER [AUSBREITUNG VON SPURENGASEN IN DER BODENNAHEN GRENZSCHICHT] **c45**
S. Kuelske *In its* Hellmut Berg Issue 1984 p 74-80 In GERMAN (For primary document see N85-29483 18-47)
Avail: NTIS HC A06/MF A01

Trace contaminant transport is considered. Type and height of chimneys, the effect of building on pollutant transport, emission threshold values, and calculation of the effective source height are discussed. Models to calculate emission, including classical Gaussian model K-models for the numerical solution of the diffusion equation, a deterministic model for the mesoscale, and models considering photochemical conversions, are presented. The numerical models give the best results but impose higher requirements on the meteorological input data. Numerical models have to be used if the boundary conditions for the Gaussian model are no longer valid. Author (ESA)

N85-29490# Technische Hochschule, Aachen (West Germany).
PHOTOCHEMICAL PROCESSES IN THE LOWER STRATOSPHERE (OZONE LAYER) [PHOTOCHEMISCHE PROZESSE IN DER UNTEREN STRATOSPHAERE (OZONSCHRICHT)] **c46**
Ulrich Schmidt *In its* Hellmut Berg Issue 1984 p 81-87 refs In GERMAN (For primary document see N85-29483 18-47)
Avail: NTIS HC A06/MF A01

Photochemical processes occurring in the ozone layer are treated. Catalytic reaction cycles in ozone chemistry are discussed. The atomic oxygen resulting from ozone photolysis is very reactive. The reaction partners are relatively long-living trace gases transported into the stratosphere; they are source gases for several radicals, the reaction of which with ozone and atomic oxygen form a cycle. The long term anthropogenic destruction of ozone by a chlorine cycle has to be estimated with numerical models taking into account the entire chemistry. The destruction is maximum at 40 km and not significant below 25 km. Not only the total amount of ozone decreases but also the form of the profile changes. Author (ESA)

N85-29491# Technische Hochschule, Aachen (West Germany).
CIRCULATION AND TRANSPORT IN THE MIDDLE ATMOSPHERE: TROPOSPHERE AND LOWER ATMOSPHERE [ZIRKULATION UND TRANSPORTE IN DER MITTLEREN ATMOSPHAERE: TROPOSPHAERE UND UNTERE STRATOSPHAERE] **c46**
P. Speth *In its* Hellmut Berg Issue 1984 p 88-91 In GERMAN (For primary document see N85-29483 18-47)
Avail: NTIS HC A06/MF A01

The circulation and transport of sensible energy and angular momentum in the winter troposphere and lower stratosphere of the Northern Hemisphere are reviewed to determine the significance of these phenomena as lower boundary conditions in the middle atmosphere. Temperature differences, mean horizontal distributions of temperature and geopotential, and geopotential waves in the troposphere are described. The mean transport of heat and momentum in the troposphere and lower stratosphere due to large scale waves is discussed. Author (ESA)

N85-29492# Technische Hochschule, Aachen (West Germany).
CIRCULATION AND TRANSPORT IN THE MIDDLE ATMOSPHERE: MESOSPHERE AND LOWER THERMOSPHERE [ZIRKULATION UND TRANSPORT IN DER MITTLEREN ATMOSPHAERE: MESOSPHAERE UND UNTERE THERMOSPHAERE] **c46**
A. Ebel *In its* Hellmut Berg Issue 1984 p 92-98 refs In GERMAN (For primary document see N85-29483 18-47)
(Contracts DFG-EB-56/63; DFG-EB-56/9-3)
Avail: NTIS HC A06/MF A01

Circulation and transport of energy and angular momentum in the mesosphere and lower thermosphere are treated. Wind measurement methods in the mesosphere and lower thermosphere using rockets and radio waves are explained. The mean circulation in the Northern Hemisphere as a function of latitude and height is described. The climatological values of the mean meridional wind are by far not as reliable as those for the zonal wind. Wave disturbances in the mesosphere and the lower thermosphere are discussed. Author (ESA)

N85-29493# Federal Aviation Administration, Atlantic City, N.J.
AUTOMATED WEATHER OBSERVING SYSTEM (AWOS) DEMONSTRATION PROGRAM Final Report, Sep. 1983 - Jun. 1984
Paul J. OBrien, J. D. Barab, F. W. Law, J. D. Talotta, and E. R. Waldmann Sep. 1984 251 p refs
(AD-A153463; FAA/CT-84-20; FAA-PM-85/1) Avail: NTIS HC A12/MF A01 CSCL 04/2

An operational demonstration of the Automated Weather Observing System (AWOS) was conducted at 14 airport installations in the contiguous United States and Alaska. The AWOS demonstration units employed were procured from two system manufacturers, WeatherMeasure and Artais, and consisted of commercially available equipment including sensors, processors, and auxiliary hardware. The sensors were used to detect and measure nine atmospheric parameters: cloud height, visibility, wind speed, wind direction, barometric pressure, temperature, dew point, precipitation occurrence, and precipitation amount. These data were then digitized, processed, synthesized into voice messages, and updated each minute. Access to the voice message by pilots in flight was accomplished by very high frequency (VHF) omnidirectional range (VOR) or discrete VHF, and for preflight purposes, by telephone access. This report discusses the analyses and provides results and conclusions derived from AWOS demonstration source data collected during the period September 1983 through June 1984. Source data included pilot questionnaire user response, maintenance personnel failure logs, hourly AWOS observations, and official observations when available. It was concluded that, in general, the performance of the system and all sensors at the 14 field sites was acceptable except for the ceilometer and precipitation sensors. GRA

N85-29494# Naval Postgraduate School, Monterey, Calif.
DIAGNOSTIC VERIFICATION OF THE GLAS (GODDARD LABORATORY FOR ATMOSPHERIC SCIENCES) GENERAL CIRCULATION MODEL AS APPLIED TO A CASE OF EXTRATROPICAL MARITIME EXPLOSIVE CYCLOGENESIS M.S. Thesis
K. A. Ebersole Dec. 1984 113 p
(AD-A153686) Avail: NTIS HC A06/MF A01 CSCL 04/2

The general circulation model from the Goddard Laboratory for Atmospheric Sciences (GLAS) is verified for a case of explosive extratropical cyclogenesis in the North Pacific. Model runs are

initialized with GLAS analyses based on the First GARP Global Experiment (FGGE) Level 3-b data. Mass and vorticity budget studies are performed on two separate sets of forecasts. One set (SAT) was initialized with all available FGGE data, while the other (NOSAT) was initialized with all FGGE data except satellite data. Explosive development occurs in conjunction with zonal mid-level flow and strong jet streak interaction. The inclusion of underestimated satellite winds in the SAT initial field weakened the intensity of the jet stream and adversely affected the forecasts. The NOSAT run indicated greater surface convergence, divergence aloft, vertical motion and PVA than the SAT run. The NOSAT prognoses developed and positioned the storm more accurately than the SAT prognoses. Author (GRA)

N85-29495# Naval Postgraduate School, Monterey, Calif.
A NUMERICAL STUDY OF THE PACIFIC POLAR LOW Ph.D. Thesis
R. M. Hodur Dec. 1984 188 p
(AD-A153777) Avail: NTIS HC A09/MF A01 CSCL 04/2

A numerical study is performed to test the hypothesis that the Pacific polar low forms primarily through baroclinic instability. Polar lows are storms, which can be violent, occurring over the oceans primarily in the winter. Linear growth rates computed for a jet profile typical of conditions during the formation of Pacific polar lows yields a growth rate maximum at 1400 km. Although the horizontal scale of this disturbance agrees with observations of the Pacific polar low, this disturbance is shallower and forms further north relative to the jet than indicated by observations. Nonlinear simulations of the 1400 km disturbance indicate that the effects of convection and surface heat and moisture fluxes due to initially large air-sea temperature differences are needed for proper vertical structure, storm position and intensification. Energy budgets of model output indicate that the wave grows through baroclinic instability and that the diabatic effects enhance the baroclinic conversion within the storm. GRA

N85-29496# Oregon Univ., Eugene. Solar Radiation Monitoring Lab.
PACIFIC NORTHWEST SOLAR RADIATION DATA
1 Apr. 1985 221 p refs
(Contract DE-AC79-81BP-24574)
(DE85-009773; DOE/BP-24574/1) Avail: NTIS HC A10/MF A01

A brief historical sketch is first presented outlining the establishment of the monitoring network and detailing some of the motivation for creating the network. The data analysis procedures are then outlined. Calibration of the instruments is essential in maintaining the accuracy of the data. The importance of chart records is stressed in the following section. A few of the important results obtained from the analysis of the data are described, including comparisons with other sites and frequency distributions. The possible effect on the data of the volcanic eruption of El Chichon in Mexico is discussed. The possible effects of El Nino on the 1983 data are also discussed. The last section before the data concerns empirical correlations determined for the Pacific Northwest. These correlations are used as the first step to determine the amount of solar radiation on a tilted surface. The data are presented in two sections. The first section contains monthly averaged data for all the sites. The last section contains a listing of all the daily solar radiation values collected by the UO network. DOE

N85-29497# European Space Agency, Paris (France).
LOOKING DOWN LOOKING FORWARD: EARTH OBSERVATION, SCIENCES AND APPLICATIONS, A PERSPECTIVE
B. Battrick, ed. Jan. 1985 54 p refs Original contains color illustrations
(ESA-SP-1073; ISSN-0396-566) Avail: NTIS HC A04/MF A01

Achievements and applications of Earth observations (from space) in atmosphere, oceans/ice, land, solid Earth, and climate and environment studies are reviewed and an ESA Earth observation program is proposed. The program comprises continuation and improvement of European involvement in satellites for meteorological applications, and in particular the development of a second-generation METEOSAT to be placed in geostationary orbit; the establishment, following ERS-1, of a program with a research and development and an operational element in ocean/ice observation; all weather monitoring and optical observation of the land surface; and a mission exploiting precise measurement techniques for solid Earth geophysics. Author (ESA)

N85-29498# Royal Netherlands Meteorological Inst., De Bilt. Dynamische Meteorologie.
PROCESSING METHODS OF RAWINSONDE MEASUREMENTS AT THE DESCENT BY PARACHUTE [METHODEN VAN BEWERKING VAN RAWINSONDE METINGEN BIJ DALING PARACHUTE]
H. M. deJong 1984 49 p refs In DUTCH; ENGLISH summary
(KNMI-WR-84-7; B8479640; ISSN-0169-1651) Avail: NTIS HC A03/MF A01

A computational approach, based on the interpretation of a special line integral theorem derivable from the equations of state and motion in the free atmosphere, is used to find reference information necessary to compute the disposable meteorological data of a descending rawinsonde. The theorem allows a special interpretation making it valid along regular integration paths and along branched curves (graphs) and is applicable to observations provided by different types of observation systems (synoptic stations, satellites). The feasibility of the method is demonstrated by the analysis of three parachute-borne soundings, one over sea and two over land. Author (ESA)

N85-29499# Royal Netherlands Meteorological Inst., De Bilt. Div. of Climatology.
CLIMATOLOGICAL DATA OF STATIONS IN THE NETHERLANDS NO. 11: FREQUENCY TABLES AND TABLES WITH RUNS ACCORDING TO MEASUREMENTS AT PRINCIPAL CLIMATOLOGICAL STATIONS 1961-1980, SUNSHINE STATIONS 1956-1980, PRECIPITATION STATIONS 1951-1980
Th. Jong 1984 142 p In DUTCH; ENGLISH summary
(KNMI-150-11; B8561756) Avail: NTIS HC A07/MF A01

Climatological data for 24hr or parts of the day relating to the average minimum and maximum temperature, the average relative humidity and vapor pressure, the amount of precipitation, the daily global radiation, and the duration of sunshine are presented. Author (ESA)

N85-29500# National Weather Service, Washington, D.C. Climate Analysis Center.
MONTHLY AND SEASONAL WEATHER OUTLOOK FOR MID-FEBRUARY TO MID-MARCH 1985, VOLUME 39, NUMBER 4, FEBRUARY 14, 1985
Feb. 1985 11 p
(PB85-164580) Avail: NTIS HC A02/MF A01 CSCL 04B

Weather maps which gives the numerical probability estimates for seasonal temperature and precipitation in North America are presented. GRA

N85-29501# National Oceanic and Atmospheric Administration, Bay St. Louis, Miss. Environmental Research Labs.
ENVIRONMENTAL RESEARCH LABORATORIES (OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION) PROGRAMS AND PLANS: FY 1984 PROGRAMS AND FY 1985 PLANS
Dec. 1984 254 p
(PB85-171494) Avail: NTIS HC A12/MF A01 CSCL 04B

The Environmental Research Laboratory program is broad, embracing studies relating to the oceans and Great Lakes, the lower and upper atmosphere, and the solar-terrestrial environment. Studies and activities focus in seven subject areas: weather observation and prediction; air quality research and technology development; climate research; solar-terrestrial research and services; marine observation and prediction; marine assessment research and services; marine resources research and services. Author (GRA)

N85-29502# Meteorology Research, Inc., Canyon Country, Calif.
APPLICATION OF CLIMATOLOGICAL ANALYSIS TO MINIMIZE AIR POLLUTION IMPACTS IN CALIFORNIA Final Report, Dec. 1982 - Aug. 1984
T. B. Smith, W. D. Saunders, and D. M. Takeuchi Aug. 1984 262 p refs
(PB85-172963; ARB-R-85/238) Avail: NTIS HC A12/MF A01 CSCL 04B

Meteorological factors affecting air pollution potential in California are summarized. Surface wind, temperature and humidity data and available temperature soundings were studied. Distributions of temperature, wind speed and direction, humidity and mixing height were determined. Meteorological parameters or combinations of parameters have been used to obtain several alternative representations of air pollution potential. These include 850 mb temperature, maximum surface temperature, Holzworth potential, ventilation factors and a combination of morning wind speeds and afternoon mixing heights. The values of these parameters were correlated with maximum ozone concentration for the day. Highest and most consistent correlations were obtained with the two temperature parameters. Differences between the times of maximum ozone and maximum temperature were used to characterize source and receptor areas. A number of factors which influence air pollution potential in the state are described. These include eddy structures, slope flows, layers aloft, convergence zones and marine air intrusions. Interbasin transport of pollutants is a major factor in the state. GRA

N85-29503# National Oceanic and Atmospheric Administration, Seattle, Wash. Marine Environmental Lab.
REGIONAL METEOROLOGY OF THE BERING SEA DURING MIZEX-WEST, FEBRUARY AND MARCH 1983
J. G. Wilson, A. L. Comiskey, R. W. Lindsay, and V. L. Long Oct. 1984 122 p refs
(PB85-173699; CONTRIB-729) Avail: NTIS HC A06/MF A01 CSCL 04B

The Marginal Ice Zone Experiment (MIZEX) West was conducted in the eastern Bering Sea during February and March 1983. During the experiment surface and upper-air meteorological observations were taken from two ships, the NOAA Ship DISCOVERER and Coast Guard Cutter WESTWIND. The meteorology of the region for this period is illustrated with fields of sea level pressure, surface air temperature (computed from the 1000-850 mb thickness), and surface winds. These fields are derived from a mesoscale hand drawn analysis that was digitized on a 6 by 5 polar stereographic grid and processed through the computer routines in METLIB. Author (GRA)

N85-29504# National Weather Service, Columbia, S. C. Forecast Office.
ISOTROPIC PLOTTER
Charles D. Little Feb. 1985 39 p
(PB85-175651; NOAA-NWS-ERCP-29) Avail: NTIS HC A03/MF A01 CSCL 04B

The program will compute or find the following data on an isentropic surface: pressure, condensation pressure, mixing ratio and wind speed and direction closest to the desired level. The input file is generated by the TTBBD, SV decoder and output is to NMCPLT40A. The program gives the operational weather forecaster another method of analyzing upper air data for day to day use. Isentropic charts are useful in finding and following two of the most important meteorological variables: areas of vertical motion and moisture. GRA

N85-29236*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ATMOSPHERIC LIMITATIONS TO CLOCK SYNCHRONIZATION AT MICROWAVE FREQUENCIES
George M. Resch *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 249-259 (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 04B

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N85-29505# Washington Univ., Seattle. Polar Science Center.
ARCTIC MIXED LAYER DYNAMICS Final Report
J. Morison Feb. 1985 40 p
(Contract N00014-83-K-0115)
(AD-A153582) Avail: NTIS HC A03/MF A01 CSCL 08/10

Contents: Seasonal Variations in the Upper Arctic Ocean as Observed at T-3: Hydrographic data from T-3 are analyzed to illustrate the behavior of the Arctic mixed layer. The mixed layer depth fluctuates 11 m annually and mixed layer salinity fluctuates 0.32% ppt. The fluctuations in total salt content are consistent with theoretical work by Maykut and are in phase with mixed layer depth, indicating changes in the mixed layer are controlled by salt flux. Oceanographic Conditions in the Marginal Ice Zone North of Svalbard in Early Fall 1979 with an Emphasis on Mesoscale Processes: During September-October 1979 the Norwegian Remote Sensing Experiment was carried out in the marginal ice zone north of Svalbard. Convergence of the ice cover is correlated with along-ice edge winds with the ice to the right, while divergence occurs during off-ice winds or calm conditions. The Fram 3 Expedition: On the fourteenth of March 1981, Fram 3 the third in a series of four U.S. manned ice camps, was established in the eastern Arctic Ocean at 84.32 N, 20.07 E for studies of physical and chemical oceanography, low-frequency underwater acoustics, geophysics, and the mechanics and propagation of waves through sea ice. Salargos Temperature-Conductivity Buoys: The design and testing of buoys capable of measuring temperature and salinity in ice covered oceans is described. The buoys are implanted in the sea ice and collect water temperature and conductivity data from pairs of sensors tethered to a cable suspended below the ice. The sensor data is collected and position is determined using the ARGOS satellite system. GRA

N85-29506# Naval Postgraduate School, Monterey, Calif.
UTILIZATION OF THE SEASAT SCATTEROMETER WINDS FOR OCEAN MIXED LAYER MODELING M.S. Thesis
Eric J. Coolbaugh Dec. 1984 101 p refs
(AD-A153748) Avail: NTIS HC A06/MF A01 CSCL 08/3

A study is made of the feasibility of using SEASAT Scatterometer wind measurements as the surface wind stress forcing for an ocean mixed layer model. Comparisons are made of daily SASS and FNOC winds and the respective mixed layer model results on a 2 degree latitude by 5 degree longitude grid from July 15 to August 15, 1978 in the Anomaly Dynamics Study region of the North Pacific Ocean. The direct comparison of the SASS and FNOC wind fields showed good agreement. Cases of reduced pattern correlation between the SASS and FNOC winds appear to result from periods of low percentage coverage by the SASS wind fields and the difference in spatial resolution between the SASS and FNOC winds. The results of the model comparison of the wind fields show the model's high sensitivity to the accuracy of its wind speed boundary condition. Nevertheless, the SASS and FNOC winds gave similar model results, demonstrating the potential of scatterometer wind speed measurements for use with future ocean mixed layer model prediction. GRA

N85-29507# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Oceanography Div.
OPERATION GUIDING LIGHT-SCIENTIFIC PROGRAM AND FIELD PLAN. THE PILOT FIELD EXPERIMENT FOR NORDA PROJECT CHEMICAL DYNAMICS IN OCEAN FRONTAL AREAS Final Report
Denis A. Wiesenburg Mar. 1985 41 p refs
(AD-A153765; NORDA-TN-308) Avail: NTIS HC A03/MF A01 CSCL 08/10

This document describes the scientific program and field plan for operation GUIDING LIGHT, the pilot field experiment for the NORDA project Chemical Dynamics in Ocean Frontal Areas. The

study area for GUIDING LIGHT is the western North Atlantic Ocean off the eastern coast of the United States. The operation will be conducted from 18 April to 10 May 1985. The fronts to be examined during this pilot experiment are the Gulf Stream front and shelf-slope front off New England. GUIDING LIGHT will employ rapid sampling and analytical capabilities to measure chemical-biological-physical variations in surface waters at these frontal boundaries. Both shipboard and remotely sensed observations will be made. The field operation will be conducted from one ship (USNS BARTLETT), three aircraft, and the space shuttle (STS 51-B). Participates in GUIDING LIGHT include investigators from the Naval Ocean Research and Development Activity, the National Aeronautics and Space Administration, University of California, Texas A & M University, Old Dominion University, Florida State University, University of Southern Mississippi, and the University of Texas. GRA

N85-29508# Coastal Engineering Research Center, Vicksburg, Miss.
SUMMARY OF ARCHIVED ATLANTIC COAST WAVE INFORMATION STUDY PRESSURE, WIND, WAVE, AND WATER LEVEL DATA Final Report
R. M. Brooks and W. D. Corson Aug. 1984 57 p
(AD-A153782; WIS-13) Avail: NTIS HC A04/MF A01 CSCL 08/3

This report is a summary of seven data sets produced and archived by the Wave Information Study (WIS) for the Atlantic coast: (1) surface pressure fields, (2) Phase 1 hindcast wind fields, (3) Phase 1 deepwater wave data, (4) Phase 2 hindcast wind fields, (5) Phase 2 hindcast wave data, (6) Phase 3 nearshore wave data, and (7) water level data. The wave parameters from the data sets listed in 2, 5, and 6 have been incorporated into WIS's computer-based data system, the Sea-State Engineering Analysis System (SEAS), which is available to all Corps of Engineers personnel. These data sets, except for 1 and 7, have been transferred to the National Climatic Data Center (NCDC) in Asheville, North Carolina. These data may be obtained through Customer Service at NCDC (reference Tape Deck 9787). GRA

N85-29509# Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
NUMERICAL TECHNIQUES FOR STEADY TWO-DIMENSIONAL TRANSCRITICAL STRATIFIED FLOW PROBLEMS, WITH AN APPLICATION TO THE INTERMEDIATE FIELD DYNAMICS OF OCEAN THERMAL ENERGY CONVERSION PLANTS Ph.D. Thesis
Janet M. Jones, Gerhard H. Jirka, and David A. Caughey Jan. 1985 360 p refs Prepared for MIT, Cambridge
(Contracts DE-AC02-78ET-20483; W-31-109-eng-38; ET-78-S-02-4683; Grant NSF CME-80-12682)
(DE85-008347; ANL/EES-TM-271) Avail: NTIS HC A16/MF A01

The development of predictive techniques for the predominantly horizontal, layered fluid motions that result when a continuous buoyant source is discharged into an ambient fluid at a bounding surface, interface or equilibrium level is studied. Although the numerical techniques developed are applicable to general discharge configurations, the model development is focused on the particular case of a radial source of buoyancy and momentum discharged into a uniform ambient crossflow. The resulting density current is analyzed by application of the depth integrated hydrodynamic equations. The density current dynamics are shown to vary with the relative intermediate to near field strengths, as characterized by the ratio of their respective length scales. The complete range of this interaction, from small near field effects to large near field effects, is investigated. Results are presented as the depth integrated velocity and current thickness distributions for different field strength values. The model predictions are compared to two sets of laboratory data and to limited field information, involving a river discharge and a submerged outfall into the ocean. DOE

N85-29510# Rome Univ. (Italy). Dipt. di Fisica.
INTERNAL WAVES IN MARINE STRAITS
V. Artale (European Nuclear Energy Agency, La Spezia, Italy) and D. Levi 4 Sep. 1984 8 p refs
(PREPRINT-415) Avail: NTIS HC A02/MF A01

By applying a perturbation technique to the Euler equation for a two-layer fluid it is shown that the evolution of the interface is described by a Korteweg-deVries equation. This model is applied to describe the tide-generation of solitons in the Straits of Gibraltar. Author (ESA)

N85-29511# Royal Netherlands Meteorological Inst., De Bilt. Oceanografisch Onderzoek.
FIRST RESULTS OF OCEANOGRAPHY UTILIZATION OF INFRARED HIGH RESOLUTION PICTURE TRANSMISSION IMAGES [EERSTE BEVINDINGEN BIJ OCEANOGRAFISCH GEBRUIK VAN IR-HRPT BEELDEN]
H. Wallbrink and G. J. Prangsma 1984 42 p refs In DUTCH
(KNMI-TR-59; B8479639; ISSN-0169-1708) Avail: NTIS HC A03/MF A01

Qualitative interpretation of infrared photographs made by the satellites NOAA 6, NOAA 7, and NOAA 8 of the Norwegian Sea, the North Sea and the Atlantic Ocean to determine utility for research on dynamic processes in the ocean and the climate is discussed. The photographs were received by the High Resolution Picture transmission facility. Making several prints with different enhancements in the playback mode of one registration provides the correct temperature fronts. Mesoscale and enlarged small scale phenomena are clearly visible. Author (ESA)

N85-29455*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECIFICATION OF SURFACE ROUGHNESS OVER OCEANS IN THE GLAS FOURTH ORDER GCM Abstract Only
H. Mark Helfand *In its* Res. Rev., 1983 Jan. 1985 p 61-62 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 08C

N85-29471*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON FOFONOFF'S MODE Abstract Only
Lee-Or Merkine (Technion - Israel Inst. of Tech.), Kingtse C. Mo (M/A-COM Sigma Data, Inc., Greenbelt, Md.), and Eugenia Kalnay *In its* Res. Rev., 1983 Jan. 1985 p 107-108 refs (For primary document see N85-29433 18-47)
Avail: NTIS HC A08/MF A01 CSCL 08C

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N85-29512# Georgia Inst. of Tech., Atlanta.
DEVELOPMENT OF AN EM-BASED LIFEFORM DETECTOR Annual Technical Report, 1 May 1984 - 31 Jan. 1985
J. Seals, S. M. Sharpe, and S. Crowgey Mar. 1985 97 p
(Contract N00014-82-C-0390)
(AD-A153504; ATR-3) Avail: NTIS HC A05/MF A01 CSCL 06/2

Georgia Tech is currently conducting a successful program to develop an electromagnetically-based lifeform detector capable of detecting vital signs-related information in battlefield casualties from extremely long ranges (10-100 meters). The original program goal was to develop a capability to detect respiratory activity in battlefield casualties from ranges up to 30 meters. However, because of the success of early program efforts, and the Navy's wishes to also detect cardiac activity, the program scope was expanded to include detection of respiratory and cardiac activity and the desired detection range was extended to 100 meters. The lifeform detector (LFD) being developed on this program measures and analyzes scattered electromagnetic fields to detect respiratory and cardiac motions associated with the casualty being evaluated. Because antenna-based techniques are being used to perform the required scattered-field measurements, true remote-sensing is achieved. That is, a casualty being evaluated does not have to be wearing

or carrying a biomedical transducer or other type of auxillary device. This fact greatly enhances the attractiveness and potential usefulness of the LFD. GRA

N85-29513# Rhode Island Univ., Kingston. Dept. of Chemistry.
A BASIC STUDY TO ASSESS THE POTENTIAL USEFULNESS OF RESONANCE RAMAN SPECTROSCOPY AS A MEANS OF RAPIDLY DETECTING AND IDENTIFYING BACTERIA AND OTHER MICROORGANISMS Final Report, 1 Oct. 1983 - 31 Dec. 1984
W. H. Nelson 15 Feb. 1985 15 p
(Contract DAAG29-83-K-0136)
(AD-A153549; ARO-20545.1-LS) Avail: NTIS HC A02/MF A01 CSCL 06/13

This past year we have explored the potential uses of Resonance Raman and Fluorescence Lifetime Spectroscopies in the rapid characterization of bacteria. Previously we have shown that chromobacteria can be distinguished on the basis of distinctive resonance Raman spectra. Spectra are excited by low power argon ion laser radiation at 488 nm and are due to the presence of carotenoid pigments. While carotenoid pigments in bacteria generally are not useful for identification purposes, the study of chromobacteria has allowed us to assess the potential sensitivity of resonance Raman spectroscopy in this application. We were able to laser illuminate and count two types of bacteria under a microscope. Because it was possible to see the laser excited bacteria while the resonance Raman spectra were being obtained, it was possible to estimate closely the number of bacteria producing a given spectrum. Such high sensitivity suggests but does not prove that spectra are surface enhanced. It is clear that the resonance Raman technique can be highly sensitive and our experiments suggest that remote detection and detection from mixtures is possible in principle. GRA

N85-29514# Pennsylvania State Univ., University Park.
SURVIVAL OF MICROORGANISMS AND BACTERIAL PREDATION IN NATURE Final Report, 1 Feb. 1982 - 28 Feb. 1985
L. E. Casida, Jr. 28 Feb. 1985 7 p
(Contract DAAG29-82-K-0055)
(AD-A153574; ARO-18755.9-LS) Avail: NTIS HC A02/MF A01 CSCL 06/13

Microscopia, plating, and bacteriophage analysis techniques were developed for following bacterial survival and bacterial predation in situ in soil. Several new predators were discovered, and their host ranges were studied. The dominant predators were identified. A new form of competition involving growth initiation factors was discovered. GRA

N85-29515# Massachusetts Inst. of Tech., Cambridge. Statistics Center.
TOWARDS A STATISTICAL ANALYSIS OF GENETIC SEQUENCES DATA WITH PARTICULAR REFERENCE TO PROTEIN SEQUENCES
S. P. Arsenis Mar. 1985 121 p
(Contract N00014-74-C-0555)
(AD-A153605; TR-36-ONR) Avail: NTIS HC A06/MF A01 CSCL 06/3

This report develops a variety of character matrices as graphical tools for the visual examination of genetic sequences and in particular protein sequences. The NNC, PNC, BNCl, BNC2, and BNC3 matrices are designed to filter noise without severely suppressing signals in the CC matrix. The Matrix Smear of a character matrix is introduced as a measure of signals and noise in the matrix. The asymptotic distribution of the smears of the CC and NNC matrices are derived under the independence model. The asymptotic result is used in conjunction with exact confidence intervals from diagonal smears to automate partially the visual examination of character matrices. A generalized likelihood ratio procedure is developed to automate fully the detection of signals in two protein sequences. A simulation study has proven the procedure to be powerful and robust in detecting signals of success probability .90 and length 9 implanted within noisy binary strings of length 291 characters and success probability .15. GRA

N85-29516# Defence Research Establishment Suffield, Ralston (Alberta).
RAPID RATE-KINETIC TURBIDOMETRIC ASSAY FOR QUANTITATION OF ANTIVIRAL COMPLEMENT-FIXING ANTIBODIES
R. E. Fulton and V. L. DiNinno Feb. 1985 25 p
(AD-A153644; DRES-1141) Avail: NTIS HC A02/MF A01 CSCL 06/1

A rapid rate-kinetic turbidometric assay for the quantification of viral complement fixing antibodies has been developed, using adenovirus as a model. The procedure is based on the turbidometric quantitation of intact sheep erythrocytes and measures the rate of hemolysis (change in absorbance per min at 640 nm) at maximum velocity occurring in the presence of residual complement not fixed by the antigen-antibody reaction. Reagents were standardized and assays performed using a microprocessor-controlled spectrophotometer with thermoregulated cell compartment and kinetic assay capability. Eleven sera were assayed for complement fixing antibodies both by the conventional microtiter technique and by the rapid turbidometric described here. Good correlation ($r = 0.88$) between the two procedures was obtained. Unlike the conventional complement fixation test, in the rate-kinetic turbidometric complement fixation test, it was found that variation in complement and antigen concentration could be tolerated, end-pointers titers were objectively quantitated, and results could be obtained within one hour. The technique may be adaptable to large-scale automation. GRA

N85-29517# Defence Research Establishment Suffield, Ralston (Alberta).
AN IN VITRO METHOD FOR THE SCREENING OF TRICHOTHECENE MYCOTOXIN CYTOTOXICITY AND THE STUDY OF MYCOTOXIN COUNTERMEASURES
V. L. DiNinno, D. Penman, A. R. Bhatti, N. P. Erhardt, and P. A. Lockwood Mar. 1985 12 p
(AD-A153663; AD-E401312; DRES-SM-1147) Avail: NTIS HC A02/MF A01 CSCL 06/20

A thymocytic cell bio-assay was developed for assessing the toxicity of the trichothecene mycotoxin T-2. The in vitro toxicity of mycotoxin T-2 towards mouse mono-nuclear leukocytes prepared from spleen, thymus, peritoneal lavage and bone marrow cells was studied. Bone marrow cells were found to more resistant to T-2 toxicity than thymus, spleen and peritoneal cell preparations. This method is rapid and provides consistant and reproducible results for the study of T-2 mycotoxicosis. GRA

N85-29518# Duke Univ., Durham, N. C. Dept. of Zoology.
RADIATION DAMAGE AND REPAIR IN CELLS AND CELL COMPONENTS. PART 2: PHYSICAL RADIATIONS AND BIOLOGICAL SIGNIFICANCE Final Report
Donald J. Fluke Aug. 1984 95 p
(Contract DE-AS05-76EV-03631)
(DE85-008934; DOE/EV-03631/13-Pt-2-Rev;
ORO-3631-13-Pt-2-Rev) Avail: NTIS HC A05/MF A01

The report comprises a teaching text, encompassing all physical radiations likely to be of biological interest, and the relevant biological effects and their significance. Topics include human radiobiology, delayed effects, radiation absorption in organisms, aqueous radiation chemistry, cell radiobiology, mutagenesis, and photobiology. DOE

N85-29519# Duke Univ., Durham, N. C. Dept. of Zoology.
RADIATION DAMAGE AND REPAIR IN CELLS AND CELL COMPONENT, PART 1 Final Report
Donald J. Fluke and Ernest C. Pollard 1984 19 p refs
(Contract DE-AS05-76EV-03631)
(DE85-008667; DOE/EV-03631/13-Pt-1; ORO-3631-13-Pt-1) Avail: NTIS HC A02/MF A01

An overview of research into the direct action of ionizing radiation, especially the effect of radiation temperature, primarily upon enzymes, into induced repair, and into S.O.S. related phenomena, is presented. DOE

N85-29520# Rome Univ. (Italy). Dipt. di Fisica.
EFFECTS OF THERMAL FLUCTUATIONS ON SYSTEMS WITH SMALL SURFACE TENSION
L. Peliti and S. Leibler (Commissariat a l'Energie Atomique, Saclay, France) 31 Jan. 1985 14 p refs
(PREPRINT-437) Avail: NTIS HC A02/MF A01

The influence of thermal fluctuations on systems with negligible surface tension (MEMBRANES) whose behavior is determined by curvature effects is considered. Fluctuations change the effective rigidity and other relevant parameters. Two-dimensional membranes appear rigid at short distances and crumpled at long distances. For more than two-dimensional membranes (or in presence of long-range forces) a crumpling transition separates a rigid low-temperature phase from a crumpled high temperature one.
Author (ESA)

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N85-29521*# Veterans Administration Hospital, San Francisco, Calif.
CHANGES IN BONE STRUCTURE AND METABOLISM DURING SIMULATED WEIGHTLESSNESS: ENDOCRINE AND DIETARY FACTORS Final Technical Report
Bernard P. Halloran and Thomas J. Wronski [1985] 8 p
(Grant NAGw-349)
(NASA-CR-175961; NAS 1.26:175961) Avail: NTIS HC A02/MF A01 CSCL 06S

The role of vitamin D, PTH and corticosterone in the skeletal alterations induced by simulated weightlessness was examined. The first objective was to determine if changes in the serum concentrations of Ca, P sub i, osteocalcin, 25-OH-D, 24,25(OH)2D or 1,25(OH)2D also occur following acute skeletal unloading. Animals were either suspended or pair fed for 2, 5, 7, 10, 12 and 15 days and the serum concentrations of Ca, P sub i, osteocalcin and the vitamin D metabolites measured. Bone histology was examined at day 5 after suspension. Acute skeletal unloading produced a transient hypercalcemia, a significant fall in serum osteocalcin and serum 1,25(OH)2D, a slight rise in serum 24,25(OH) 2D, but did not affect the serum concentrations of P sub i or 25-OH-D. At the nadir in serum 1,25(OH)2D serum osteocalcin was reduced by 22%, osteoblast surface by 32% and longitudinal bone growth by 21%. E.A.K.

N85-29522*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE ROLE OF 1,25-DIHYDROXYVITAMIN D IN THE INHIBITION OF BONE FORMATION INDUCED BY SKELETAL UNLOADING
Bernard P. Halloran (Veterans Administration Hospital, San Francisco), Daniel D. Bikle (California Univ., San Francisco), Thomas J. Wronski (Florida Univ., Gainesville), Ruth K. Globus (California Univ., San Francisco), Marilyn J. Levens (California Univ., San Francisco), and Emily Morey-Holton [1983] 25 p refs
(Grant NAGw-349)
(NASA-TM-87480; NAS 1.15:87480) Avail: NTIS HC A02/MF A01 CSCL 06P

Skeletal unloading results in osteopenia. To examine the involvement of vitamin D in this process, the rear limbs of growing rats were unloaded and alterations in bone calcium and bone histology were related to changes in serum calcium (Ca), inorganic phosphorus (P sub i), 25-hydroxyvitamin D (25-OH-D), 24,25-dihydroxyvitamin D (24,25(OH)2D and 1,25-dihydroxyvitamin D (1,25(OH)2D. Acute skeletal unloading induced a transitory inhibition of Ca accumulation in unloaded bones. This was accompanied by a transitory rise in serum Ca, a 21% decrease in longitudinal bone growth ($P < 0.01$), a 32% decrease in bone surface lined with osteoblasts ($P < .05$), no change in bone surface lined with osteoclasts and a decrease in circulating (1,25(OH)2D. No significant changes in the serum concentrations of P sub i, 25-OH-D or 24,25(OH)2D were observed. After 2 weeks of unloading, bone Ca stabilized at approximately 70% of control and serum Ca and 1,25(OH)2D returned to control values. Maintenance of a constant serum 1,25(OH)2D concentration by chronic infusion of 1,25(OH)2D (Alza osmotic minipump) throughout the study period did not prevent the bone changes induced by acute unloading. These results suggest that acute skeletal unloading in the growing rat produces a transitory inhibition of bone formation which in turn produces a transitory hypercalcemia.
F.M.R.

N85-29523# Army Research Inst. of Environmental Medicine, Natick, Mass.
PLASMA HORMONAL RESPONSES AT GRADED HYPOHYDRATION LEVELS DURING EXERCISE/HEAT STRESS
R. P. Francesconi, M. N. Sawka, K. B. Pandolf, R. W. Hubbard, and A. J. Young 28 Mar. 1985 23 p
(AD-A153681) Avail: NTIS HC A02/MF A01 CSCL 06/19

The effects of graded levels of hypohydration (3%, 5% and 7%) on hormonal responses to exercise in the heat were examined in six heat-acclimated, male volunteers. On the day following the dehydration procedure, subjects performed light intensity exercise in a hot (49 C, 20% rh) environment for four consecutive 25 min intervals interspeed by 10 min rest periods; a blood sample was obtained prior to exercise and during the last 10 min of each exercise period. Results generally indicated that during euhydration, plasma cortisol levels manifested significant decrements over time, probably related to the normal diurnal periodicity of this hormone. However, during hypohydration, levels of plasma cortisol were increased and correlated with hypohydration intensity. Plasma renin activity was increased significantly by hypohydration, but was unaffected by exercise in the heat. Alternatively, plasma aldosterone levels were increased more consistently by both exercise in the heat and hypohydration. We have demonstrated that hormonal responses are altered by the level of hypohydration and confirmed that the acquisition of heat acclimation probably blunts the hormonal responses during exercise in the heat. GRA

N85-29524# Michigan State Univ., East Lansing. Dept. of Biomechanics.
THE POSITION AND MOBILITY OF THE SHOULDER, SPINAL COLUMN AND PELVIS IN SEATED SUBJECTS Final Report, Mar. 1982 - Sep. 1983
H. M. Reynolds, Sik-Chuen Leung, and Vance Kincaid, II Wright-Patterson AFB, Ohio Aerospace Medical Research Labs. Feb. 1985 66 p refs
(Contract F33615-82-K-0516; AF Proj. 2313)
(AD-A153751; AFAMRL-TR-84-060) Avail: NTIS HC A04/MF A01 CSCL 06/16

This report describes the results and data formats for a study to investigate three-dimensional internal kinematics of the human shoulder complex, individual vertebrae and the pelvis in unembalmed cadavers by means of stereoradiography. The motion is measured by tracking three-dimensional displacements of multiple radio opaque targets imbedded in the clavicle, scapula, sternum, humerus, a number of vertebrae, and the pelvis. The motion is produced by repositioning the cadavers to produce various degrees of spinal flexion and extension approximating different seated positions. To produce motion in the shoulder complex, the upper arm was moved in adduction and abduction. Sufficient targets were tracked on each of the motion segments to describe six-degree-of-freedom motion for each. In this study, data were collected on three cadavers and analyzed to provide descriptions of motion by position, vectors of targets imbedded with respect to anatomical landmarks and screw axis parameters both expressed with respect to an external fixed reference system and to the adjacent motion segment. A detailed description is provided of the data formats used in generating a magnetic tape, containing the analyzed experimental data, for the Air Force Aerospace Medical Research Laboratory. GRA

N85-29525# Army Research Inst. of Environmental Medicine, Natick, Mass.

EFFECT OF SPIRONOLACTONE ON ACUTE MOUNTAIN SICKNESS

R. F. Larsen, P. B. Rock, C. S. Fulco, B. Edelman, and A. J. Young 11 Apr. 1985 17 p

(AD-A153780; USARIEM-M-26/85) Avail: NTIS HC A02/MF A01 CSCL 06/15

This study examined the effectiveness of Spironolactone as a prophylactic agent for the prevention of Acute Mountain Sickness (AMS). Spironolactone 25mg PO QID or placebo was administered to 9 subjects in a double-blind placebo controlled cross over design. Medication was given for 48h prior to and during a 46h exposure to 427 torr (4570m) in a hypobaric chamber. Six subjects demonstrated prevention of either the cerebral or respiratory symptoms of AMS during at least 1 segment of the altitude sojourn. GRA

N85-29526# Army Medical Research and Development Command, Fort Detrick, Md.

RELATIONSHIP BETWEEN THE ARMY TWO MILE RUN TEST AND MAXIMAL OXYGEN UPTAKE

Robert P. Mello, Michelle M. Murphy, and James A. Vogel Dec. 1984 32 p refs

(DA Proj. 3E1-62777-A-879)

(AD-A153914; USARIEM-T-3/85) Avail: NTIS HC A03/MF A01 CSCL 06/14

Forty-four male (aged 20-51) and seventeen female (aged 20-37) subjects of various fitness and activity levels were evaluated on a two mile run for time and on a treadmill for maximal oxygen consumption. The coefficient of correlation between the treadmill maximal test and the two mile run test for all subjects was -0.91. Separate regression analyses for male and female data also displayed significant correlations (rm = -0.91, rf = -0.89). Stepwise multiple regression analysis of such anthropometric variables as age, height, weight, and % body fat demonstrated that, individually, none of these parameters significantly improved the predictability of both the male and female equations. However, inclusion of body weight in the male equation did improve the predictive accuracy (SEE = 3.31 to 2.69). The high degree of correlation demonstrated between VO2 max and two mile run time thus permits the estimation of either component with significant accuracy from the direct measurement of the other. This study confirms the usefulness and validity of the Army's 2 mile run for time test to indicate the level of aerobic fitness capacity when the test is properly supervised and the subjects are well-motivated. GRA

N85-29527# Los Alamos Scientific Lab., N. Mex.

IMAGE PROCESSING: MATHEMATICS, ENGINEERING OR ART

K. M. Hanson 1985 13 p refs Presented at the SPIE Conf. on Appl. of Optical Instr. to Med. 13, Newport Beach, Calif., 3 Feb. 1985

(Contract W-7405-eng-36)

(DE85-007666; LA-UR-85-560; CONF-850268-1) Avail: NTIS HC A02/MF A01

From the strict mathematical viewpoint, it is impossible to fully achieve the goal of digital image processing, which is to determine an unknown function of two dimensions from a finite number of discrete measurements linearly related to it. However, the necessity to display image data in a form that is visually useful to an observer supersedes such mathematically correct admonitions. Engineering defines the technological limits of what kind of image processing can be done and how the resulting image can be displayed. The appeal and usefulness of the final image to the human eye pertains to aesthetics. Effective image processing necessitates unification of mathematical theory, practical implementation, and artistic display. DOE

N85-29528# Oak Ridge National Lab., Tenn. Chemical Effects Information Center.

CHEMICALS IDENTIFIED IN HUMAN BIOLOGICAL MEDIA, A DATA BASE. VOLUME 6, PART 2: RECORDS 7588-8694 Annual Report, Sep. 1982 - Sep. 1983

Virginia Cone, comp., Margaret F. Baldauf, comp., Dennis M. Opresko, comp., Mary S. Uziel, comp., and Betty Chilton, comp. Apr. 1984 488 p

(Contracts DE-AC05-84OR-21400; EPA-IAG-78-D-X383)

(DE85-008767; ORNI/EIS-163-Vol-6-Pt-2;

EPA-560/5-83-012-Vol-6-Pt-2; AR-5-Vol-6-Pt-2) Avail: NTIS HC A21/MF A01

A comprehensive data base of chemicals identified in human biological media (tissues and body fluids) was established under the direction of the Environmental Protection Agency's Office of Toxic Substances Exposure Evaluation Division. This centralized resource of the body burden information was inspired by the concern of government scientists over continuing reports of toxic chemicals in human tissues and body fluids. Data were obtained primarily from the open literature through manual searches of selected journals. The file contains information on over 1000 chemicals that was found in human biological media. Part 2 contains body burden data extracted since the last publication of the data base. DOE

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N85-29529# Canyon Research Group, Inc., Westlake Village, Calif.

VISUAL AND PART-TASK MANIPULATIONS FOR TEACHING SIMULATED CARRIER LANDINGS Final Interim Report, 1 Sep. 1981 - 31 Aug. 1984

D. J. Sheppard 19 Mar. 1985 98 p

(Contract N61339-81-C-0105; NR Proj. SP0-10785)

(AD-A153622; NAVTRAEQUIPC-81-C-0150-9) Avail: NTIS HC A05/MF A01 CSCL 05/9

A quasi-transfer-of-training study was conducted with 36 flight-naive subjects to investigate a segmentation method of part-task training, and two methods of visual augmentation, for teaching simulated carrier landings. One visual enhancement involved adding two types of descent rate information (designated RATE and COMMAND) to the FLOLS display. The experimental sequence consisted of 30 training trials with instructional feedback under a particular experimental condition, followed by 30 test trials with no instructional feedback under the criterion condition (whole task with conventional and small FLOLS). Possibly the most important finding of this study is that transfer from a large to a small FLOLS has no general detrimental effects. The fact that a larger FLOLS can provide satisfactory training will permit a less expensive approach to simulating the FLOLS. A possible difficulty with AOA control in early transfer was noted, but sufficient care in training should overcome this potential problem. GRA

N85-29530# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

A TASK BATTERY FOR APPLIED HUMAN PERFORMANCE ASSESSMENT RESEARCH

C. A. Shingledecker Nov. 1984 52 p

(AD-A153677; AFAMRL-TR-84-071) Avail: NTIS HC A04/MF A01 CSCL 05/8

The Criterion Task Set (CTS), V1.0 is a battery of human performance tests designed to place selective demands on the elementary mental resources and information processing functions of the human operator. Currently under development as a general purpose research tool for applied investigations of human performance capabilities, the CTS V1.0 includes nine standardized tasks which are implemented in user-friendly software on an inexpensive microcomputer system. This interim report describes the theoretical basis of the CTS, the rationale used in its construction, and the parametric research conducted to establish standard loading levels, pacing rates, and training requirements for each of the tasks. Potential research applications of the CTS are discussed as well as planned developmental efforts intended to enhance it utility. Documentation for the CTS V1.0 is provided in the form of

detailed individual task descriptions and brief summaries of hardware requirements and software characteristics. GRA

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N85-29531*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM. LIFE SUPPORT SYSTEMS IN SPACE TRAVEL
Robert D. MacElroy, ed., David T. Smernoff, ed. (New Hampshire Univ., Durham), and Harold P. Klein, ed. (Santa Clara Univ., Calif.) Jun. 1985 74 p refs Proc. of the 25th COSPAR Meeting, held in Graz, Jul. 1984
(NASA-CP-2378; A-85190; NAS 1.55:2378) Avail: NTIS HC A04/MF A01 CSCL 06K

Life support systems in space travel, in closed ecological systems were studied. Topics discussed include: (1) problems of life support and the fundamental concepts of bioregeneration; (2) technology associated with physical/chemical regenerative life support; (3) projection of the break even points for various life support techniques; (4) problems of controlling a bioregenerative life support system; (5) data on the operation of an experimental algal/mouse life support system; (6) industrial concepts of bioregenerative life support; and (7) Japanese concepts of bioregenerative life support and associated biological experiments to be conducted in the space station. For individual titles, see N85-29532 through N85-29538.

N85-29532*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CURRENT CONCEPTS AND FUTURE DIRECTIONS OF CELSS
R. D. MacElroy and James Bredt *In its* Controlled Ecol. Life Support System Jun. 1985 p 1-9 refs (For primary document see N85-29531 18-54)
Avail: NTIS HC A04/MF A01 CSCL 06K

Bioregenerative life support systems for use in space were studied. Concepts of such systems include the use of higher plants and/or microalgae as sources of food, potable water and oxygen, and as sinks for carbon dioxide and metabolic wastes. Recycling of materials within the system will require processing of food organism and crew wastes using microbiological and/or physical chemical techniques. The dynamics of material flow within the system will require monitoring, control, stabilization and maintenance imposed by computers. Studies included higher plant and algal physiology, environmental responses, and control; flight experiments for testing responses of organisms to weightlessness and increased radiation levels; and development of ground based facilities for the study of recycling within a bioregenerative life support system. E.A.K.

N85-29533*# Yokohama National Univ. (Japan). Dept. of Chemical Engineering.
SURVEY OF CELSS CONCEPTS AND PRELIMINARY RESEARCH IN JAPAN
Haruhiko Ohya, Tairo Oshima (Tokyo Inst. of Tech.), and Keiji Nitta (National Aerospace Lab., Tokyo, Japan) *In* NASA. Ames Research Center Controlled Ecol. Life Support System Jun. 1985 p 10-16 refs (For primary document see N85-29531 18-54)
Avail: NTIS HC A04/MF A01 CSCL 06K

Agricultural and other experiments relating to the development of a controlled ecological life support system (CELSS) were proposed. The engineering feasibility of each proposal was investigated by a CELSS experiment concept met study group. The CELSS experiment concept to clarify the goals of CELSS and to determine three phases to achieve the goals. The resulting phases, or missions, and preliminary proposals and studies needed to develop a CELSS are described. E.A.K.

N85-29534*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
BLSS: A CONTRIBUTION TO FUTURE LIFE SUPPORT
A. I. Skoog *In* NASA. Ames Research Center Controlled Ecol. Life Support System Jun. 1985 p 17-28 refs (For primary document see N85-29531 18-54)
Avail: NTIS HC A04/MF A01 CSCL 06K

The problem of the supply of basic life supporting ingredients was analyzed. Storage volume and launch weight of water, oxygen and food in a conventional nonregenerable life support system are directly proportional to the crew size and the length of the mission. Because of spacecraft payload limitations this requires that the carbon, or food, recycling loop, the third and final part in the life support system, be closed to further reduce logistics cost. Advanced life support systems need to be developed in which metabolic waste products are regenerated and food is produced. Biological life support systems (BLSS) satisfy the space station environmental control functions and close the food cycle. Numerous scientific space experiments were delineated, the results of which are applicable to the support of BLSS concepts. Requirements and concepts are defined and the feasibility of BLSS for space application are analyzed. The BLSS energy mass relation, and the possibilities to influence it to achieve advantages for the BLSS are determined. A program for the development of BLSS is proposed. E.A.K.

N85-29535*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ADVANCED REGENERATIVE ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS: AIR AND WATER REGENERATION
F. H. Schubert (Life Systems, Inc., Cleveland, Ohio), R. A. Wynveen, and P. D. Quattrone (Life Systems, Inc., Cleveland, Ohio) *In its* Controlled Ecol. Life Support System Jun. 1985 p 29-38 refs (For primary document see N85-29531 18-54)
Avail: NTIS HC A04/MF A01 CSCL 06K

Extended manned space missions will require regenerative life support techniques. Past manned missions used nonregenerative expendables, except for a molecular sieve based carbon dioxide removal system aboard Skylab. The resupply penalties associated with expendables becomes prohibitive as crew size and mission duration increase. The Space Station scheduled to be operational in the 1990's is based on a crew of four to sixteen and a resupply period of 90 days or greater. It will be the first major spacecraft to employ regenerable techniques for life support. The techniques to be used in the requirements for the space station are addressed. E.A.K.

N85-29536*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ATMOSPHERE BEHAVIOR IN GAS-CLOSED MOUSE-ALGAL SYSTEMS: AN EXPERIMENTAL AND MODELLING STUDY
Maurice M. Averner, Berrien Moore, III (New Hampshire Univ.), Irene Bartholomew (New Hampshire Univ.), and Robert Wharton *In its* Controlled Ecol. Life Support System Jun. 1985 p 39-46 refs (For primary document see N85-29531 18-54)
Avail: NTIS HC A04/MF A01 CSCL 06K

A dual approach of mathematical modelling and laboratory experimentation aimed at examining the gas exchange characteristics of artificial animal/plant systems closed to the ambient atmosphere was initiated. The development of control techniques and management strategies for maintaining the atmospheric levels of carbon dioxide and oxygen at physiological levels is examined. A mathematical model simulating the atmospheric behavior in these systems was developed and an experimental gas closed system was constructed. These systems are described and preliminary results are presented. E.A.K.

N85-29537*# California Univ., Berkeley. Dept. of Mechanical Engineering.
DYNAMIC CONSIDERATIONS FOR CONTROL OF CLOSED LIFE SUPPORT SYSTEMS
P. S. Babcock, D. M. Auslander, and R. C. Spear *In* NASA.

Ames Research Center Controlled Ecol. Life Support System Jun. 1985 p 47-54 refs (For primary document see N85-29531 18-54)
Avail: NTIS HC A04/MF A01 CSCL 06K

Reliability of closed life support systems depend on their ability to continue supplying the crew's needs during perturbations and equipment failures. The dynamic considerations interact with the basic static design through the sizing of storages, the specification of excess capacities in processors, and the choice of system initial state. A very simple system flow model was used to examine the possibilities for system failures even when there is sufficient storage to buffer the immediate effects of the perturbation. Two control schemes are shown which have different dynamic consequences in response to component failures. E.A.K.

N85-29538*# Boeing Aerospace Co., Seattle, Wash. Space Systems Div.
CELSS TRANSPORTATION ANALYSIS
R. L. Olson, E. A. Gustan, and T. J. Vinopal *In* NASA. Ames Research Center Controlled Ecol. Life Support System Jun. 1985 p 55-64 refs (For primary document see N85-29531 18-54)
Avail: NTIS HC A04/MF A01 CSCL 06K

Regenerative life support systems based on the use of biological material was considered for inclusion in manned spacecraft. Biological life support systems are developed in the controlled ecological life support system (CELSS) program. Because of the progress achieved in the CELSS program, it is determined which space missions may profit from use of the developing technology. Potential transportation cost savings by using CELSS technology for selected future manned space missions was evaluated. Six representative missions were selected which ranged from a low Earth orbit mission to those associated with asteroids and a Mars sortie. The crew sizes considered varied from four persons to five thousand. Other study parameters included mission duration and life support closure percentages, with the latter ranging from complete resupply of consumable life support materials to 97% closure of the life support system. The analytical study approach and the missions and systems considered, together with the benefits derived from CELSS when applicable are described. E.A.K.

N85-29539*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PROCEEDINGS OF THE SEMINAR ON SPACE STATION HUMAN PRODUCTIVITY
Marc M. Cohen, comp. and Erika Rosenberg, comp. (San Jose State Univ.) Mar. 1985 747 p refs Seminar held at Moffett Field, Calif., 27 Feb. - 2 Mar. 1984
(NASA-TM-86673; NAS 1.15:86673) Avail: NTIS HC A99/MF E03 CSCL 05H

An exploration of the issues which surround some of the elements of the Human Productivity Program is given. Five general topics were discussed: (1) crew safety, (2) internal contamination, (3) the definition of the Human Productivity Program, (4) aspects of architecture that affect productivity, and (5) the role of mock-ups in the Human Productivity Program. For individual titles, see N85-29540 through N85-29573.

N85-29540*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION CREW SAFETY: HUMAN FACTORS INTERACTION MODEL
Marc M. Cohen and Maria K. Junge *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 11 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

A model of the various human factors issues and interactions that might affect crew safety is developed. The first step addressed systematically the central question: How is this space station different from all other spacecraft? A wide range of possible issue was identified and researched. Five major topics of human factors issues that interacted with crew safety resulted: Protocols, Critical Habitability, Work Related Issues, Crew Incapacitation and Personal Choice. Second, an interaction model was developed that would show some degree of cause and effect between objective environmental or operational conditions and the creation of potential safety hazards. The intermediary steps between these two extremes of causality were the effects on human performance and the results of degraded performance. The model contains three milestones: stressor, human performance (degraded) and safety hazard threshold. Between these milestones are two countermeasure intervention points. The first opportunity for intervention is the countermeasure against stress. If this countermeasure fails, performance degrades. The second opportunity for intervention is the countermeasure against error. If this second countermeasure fails, the threshold of a potential safety hazard may be crossed. R.J.F.

N85-29541*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION CREW SAFETY ALTERNATIVES STUDY, THIRD QUARTER BRIEFING Status Report
B. Peercy and L. Rockoff *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 67 p (For primary document see N85-29539 18-54)
(Contract NAS1-17242)
Avail: NTIS HC A99/MF E03 CSCL 05H

Information on a study of space station crew safety alternatives is given in outline form. Threats and strategies, human factors, historical precedents, and safety criteria are listed. R.J.F.

N85-29542*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
STATEMENT OF CONTAMINATION PROBLEM **c45**
W. Hoffler *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 10 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Space station contamination information is given. There are five major areas in which there are task requirements: (1) potential contaminants need to be identified, i.e., both the sources and types of contaminants, (2) the scope and magnitude of contaminant effects need to be determined, i.e., toxicological effects, microbacteriological effects and impurities, (3) mathematical models for predictive methods need to be developed. (4) state-of-the-art and advanced technologies for monitoring contaminants and for methods of decontamination need to be identified, and (5) automated monitoring and control systems need to be designed. R.J.F.

N85-29543*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INTERNAL CONTAMINATION ISSUES **c45**
L. Rockoff *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 16 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Issues concerning contaminated spacecraft atmospheres are identified. Contaminants found in the space shuttle orbiter atmospheric samples are listed. Crew physiological reactions are noted. R.J.F.

N85-29544*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MATERIALS AND PROCESSES CONTROL FOR SPACE APPLICATIONS **c31**
G. A. Blackburn *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 10 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 13L

Materials and processes control relative to space applications is discussed. The components of a total material and process control system are identified, contamination control issues are listed, and recommendations are made. R.J.F.

N85-29545*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VENTILATION FLOW: SUBMERGED c45
D. Hutchinson *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 30 p ref (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

The ventilation system on a submarine is discussed. When the submarine is submerged. The ventilation system provides a conditioned atmosphere in the ship with complete isolation from the outside. A conditioned atmosphere includes not only filtration and temperature and humidity control, but also air purification (removal of potentially harmful quantities of impurities and comtaminants) and revitalization (addition of vital life support oxygen). Carbon dioxide removal, the oxygen system, air conditioning, carbon monoxide removal, hydrogen removal, and atmosphere monitoring systems are among the topics discussed. R.J.F.

N85-29546*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMBIENT AIR CONTAMINATION: CHARACTERIZATION AND DETECTION TECHNIQUES c45
C. P. Nulton and H. S. Silvus *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 9 p refs (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Techniques to characterize and detect sources of ambient air contamination are described. Chemical techniques to identify indoor contaminants are outlined, they include gas chromatography, or colorimetric detection. Organics generated from indoor materials at ambient conditions and upon combustion are characterized. Piezoelectric quartz crystals are used as precision frequency determining elements in electronic oscillators. E.A.K.

N85-29547*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXTENDED MISSION LIFE SUPPORT SYSTEMS
P. D. Quattrone *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 19 p refs (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06K

Extended manned space missions which include interplanetary missions require regenerative life support systems. Manned mission life support considerations are placed in perspective and previous manned space life support system technology, activities and accomplishments in current supporting research and technology (SR&T) programs are reviewed. The life support subsystem/system technologies required for an enhanced duration orbiter (EDO) and a space operations center (SOC), regenerative life support functions and technology required for manned interplanetary flight vehicles, and future development requirements are outlined. The Space Shuttle Orbiters (space transportation system) is space cabin atmosphere is maintained at Earth ambient pressure of 14.7 psia (20% O2 and 80% N2). The early Shuttle flights will be seven-day flights, and the life support system flight hardware will still utilize expendables. E.A.K.

N85-29548*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE SHUTTLE REVITALIZATION SYSTEM
P. D. Quattrone *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 30 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06K

The Space Shuttle air revitalization system is discussed. The sequential steps in loop closure are examined and a schematic outline of the regenerative air revitalization system is presented. Carbon dioxide reduction subsystem concepts are compared. Schemes are drawn for: static feedwater electrolysis cell, solid polymer electrolyte water electrolysis cell, air revitalization system, nitrogen generation reactions, nitrogen subsystem staging, vapor compression distillation subsystem, thermoelectric integrated membrane evaporation subsystem, catalytic distillation water reclamation subsystem, and space shuttle solid waste management system. DOE

N85-29549*# Hamilton Standard, Hartford, Conn.
INTERNAL CONTAMINATION IN THE SPACE STATION c45
Chris Poythress *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 25 p refs (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Atmosphere trace contaminant control systems used in the past (Lunar Module and Skylab) and present (nuclear submarines and Shuttle) are discussed. Recommendations are made for the future Space Station contaminant control system. The prevention and control methods used are judicious material selection, detection, and specific removal equipment. Sources and effects of contamination relating to crew and equipment are also discussed. E.A.K.

N85-29550*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION TRACE CONTAMINANT CONTROL c45
T. Olcutt *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 16 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Different systems for the control of space station trace contaminants are outlined. The issues discussed include: space-cabin contaminant sources, technology base, contaminant control system elements and configuration, approach to contaminant control, contaminant load model definition, spacecraft maximum allowable concentrations, charcoal bed sizing and performance characteristics, catalytic oxidizer sizing and performance characteristics, special sorbent bed sizing, animal and plant research payload problems, and emergency upset contaminant removal. It is concluded that the trace contaminant control technology base is firm, the necessary hardware tools are available, and the previous design philosophy is still applicable. Some concerns are the need as opposed to danger of the catalytic oxidizer, contaminants with very low allowable concentrations, and the impact of relaxing materials requirements. E.A.K.

N85-29551*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GAS CHROMATOGRAPHY: POSSIBLE APPLICATION OF ADVANCED INSTRUMENTATION DEVELOPED FOR SOLAR SYSTEM EXPLORATION TO SPACE STATION CABIN ATMOSPHERES c45
Glenn C. Carle *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 15 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Gas chromatography (GC) technology was developed for flight experiments in solar system exploration. The GC is a powerful analytical technique with simple devices separating individual components from complex mixtures to make very sensitive quantitative and qualitative measurements. It monitors samples containing mixtures of fixed gases and volatile organic molecules. The GC was used on the Viking mission in support of life detection experiments and on the Pioneer Venus Large Probe to determine the composition of the venusian atmosphere. A flight GC is under development to study the progress and extent of STS astronaut denitrogenation prior to extravehicular activity. Advanced flight GC concepts and systems for future solar system exploration are also studied. Studies include miniature ionization detectors and associated control systems capable of detecting from ppb up to 100% concentration levels. Further miniaturization is investigated using photolithography and controlled chemical etching in silicon wafers. Novel concepts such as ion mobility drift spectroscopy and multiplex gas chromatography are also developed for future flight experiments. These powerful analytical concepts and associated hardware are ideal for the monitoring of cabin atmospheres containing potentially dangerous volatile compounds. E.A.K.

N85-29552*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MASS SPECTROMETRY TECHNOLOGY AT THE JET PROPULSION LABORATORY (JPL) **c45**
Charles E. Giffin *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 17 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Recent developments in the field of mass spectrometry taking place at the Caltech Jet Propulsion Laboratory are highlighted. The pertinent research and development is aimed at producing an ultrahigh sensitivity mass spectrograph for both spaceflight and terrestrial applications. The unique aspect of the JPL developed technology is an integrating focal plane ion detector that obviates the need for spectral scanning since all ions over a wide mass range are monitored simultaneously. The ion detector utilizes electro-optical technology and is therefore referred to as an Electro-Optical Ion Detector (EOID). A technical description of the JPL MS/EOID, some of the current applications, and its potential benefits for internal contamination analysis are discussed. B.W.

N85-29553*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ATMOSPHERE MONITORING REQUIREMENTS **c45**
M. Ruecker *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 29 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Atmospheric monitoring needs and requirements associated with the use of the Mass Spectrometer Electro-Optical Ion Detector for space stations contamination studies are discussed. Instrument performance requirements and design specifications are examined. A general overview is presented of the types of chemical contaminants found in spacecraft environments. B.W.

N85-29554*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOME PROBLEMS ASSOCIATED WITH TRACE CONTAMINANT REMOVAL SYSTEMS FOR SPACECABINS **c45**
T. Wydeven *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 15 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Potential problems associated with acid gas sorbents, activated charcoal beds and the catalytic oxidizer proposed for spacecabin trace contaminant control are discussed. The need for further research on atmospheric trace contaminant control methods is noted. B.W.

N85-29555*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTAMINATION CONTROL FOR INCREASED CREW PRODUCTIVITY **c45**
D. B. Heppner and C. W. Miller *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 29 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06T

Contamination control methods that contribute to increased spacecrew productivity are examined in detail. Space station contaminant sources in the water and in the air are described. B.W.

N85-29556*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HUMAN PRODUCTIVITY PROGRAM DEFINITION
D. B. Cramer *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 26 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06K

The optimization of human productivity on the space station within the existing resources and operational constraints is the aim of the Human Productivity Program. The conceptual objectives of the program are as follows: (1) to identify long lead technology; (2) to identify responsibility for work elements; (3) to coordinate the development of crew facilities and activities; and (4) to lay the foundation for a cost effective approach to improving human productivity. Human productivity work elements are also described and examples are presented. B.W.

N85-29557*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE HUMAN ROLE IN SPACE (THURIS)
Harry L. Wolbers *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 42 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06K

An overview of the human role in space station activities is presented. Associated factors such as performance cost, and risk are discussed. Benefits gained from previous successful manned space missions are highlighted. Human qualifications and capabilities associated with man machine systems are explored. Candidate procedures to be carried out by extravehicular activity spacecrews are described. B.W.

N85-29558*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OVERVIEW: HUMAN FACTORS ISSUES IN SPACE STATION ARCHITECTURE
Marc M. Cohen *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 27 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06K

An overview is presented of human factors issues in space station architecture. The status of the space station program is given. Habitability concerns such as vibroacoustics, lighting systems, privacy and work stations are discussed in detail. B.W.

N85-29559*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PRELIMINARY HUMAN FACTORS PLANNING AND DESIGN OUTLINE OF PARAMETERS RELATED TO SPACE STATION WINDOWS AND CCTV MONITORING
Richard F. Haines *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 12 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 06K

The question of the merits of placing windows on proposed future space stations is addressed. The use of windows for human visual capabilities is compared to using closed circuit television. Placement and field of view, as well as the number of windows is discussed. G.L.C.

N85-29560*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HUMAN FACTORS ISSUES IN SPACE STATION ARCHITECTURE
Jim Lewis *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 13 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Space station human productivity is considered from the prospective of human factors engineering in space station architecture. G.L.C.

N85-29561*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MAN-MACHINE TRADEOFF STUDY
Abe Feinberg and Wayne Zimmerman *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 10 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

An automation assessment was conducted to determine which components of the space station should be selected for automation. The exercise took the form of a man-machine tradeoff study. G.L.C.

N85-29562*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SOME IDEAS AND QUESTIONS REGARDING SPACE STATION DESIGN FOR HUMAN USE
Sharon Skolnick *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 9 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Design concepts for interior utility of space station crew areas are offered. Planning of a living environment that maintains elements of humanity is stressed. G.L.C.

N85-29563*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HUMAN PRODUCTIVITY EXPERIENCE AND UNDERSEA HABITAT DESIGN
Thomas C. Taylor (TAI) and John S. Spencer (SHDA) *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 16 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Lessons learned from the Alaskan North Slope construction camps and the Western Regional Undersea Laboratory are analyzed with respect to possible improvements for space station interior space utilization and living areas. The human factors engineering aspects have a direct bearing on the condition of crew and occupants. G.L.C.

N85-29564*# Boeing Co., Seattle, Wash.
CONSIDERATIONS FOR SPACE STATION INTERIOR ARCHITECTURE
Brand Griffin *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 63 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Human factors were taken into consideration as a major design factor for space station design. Other considerations include occupant activity and interior architecture. G.L.C.

N85-29565*# Hamilton Standard, Hartford, Conn.
HUMAN FACTORS IN SPACE STATION ARCHITECTURE: THE ECLSS MODULE CONCEPT
Chris Poythress *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 14 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Human factors engineering concepts were considered for the ECLSS module concept space station. ECLS modules were conceptually examined to determine their advantages and disadvantages. G.L.C.

N85-29566*# Lockheed Aircraft Corp., Burbank, Calif.
HABITABILITY SLEEP ACCOMMODATIONS
H. T. Fisher *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 14 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Schematic outlines are presented with various design requirements for the accommodation of the spacecrew of Space Stations. The primary concern is for sleeping accommodations. Some other general requirements given are for a rest place, entertainment, dressing area, personal item stowage, body restraint, total privacy, external viewing, and grooming provisions. Several plans are given for sleep quarters concepts. E.R.

N85-29567*# McDonnell Aircraft Co., St. Louis, Mo.
CUSTOMER AND MISSION INFLUENCE ON SPACE STATION ARCHITECTURE
Fritz Runge *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 17 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Overall Space Station architecture is presented in schematic outlines and plans. How the customer and mission needs influence this design is studied. The uses, occupants, activities, interfaces, utilities, locomotion, environments, and technological costs are all factors which influence the architecture. User and system functions are profiled, interfaces are characterized and functions are grouped. These lead to packaging of functions into modules and the design of system and user accommodations. E.R.

N85-29568*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SIMULATION FOR HUMAN FACTORS RESEARCH. A CENTRAL QUESTION: FIDELITY
David Nagel *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 4 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Generalized outlines are presented for simulation in human factors research. Recent trends in aeronautical simulation are given. Some criteria for effective training devices are also given. Full system/full mission simulation in aviation and in space human factors research is presented. E.R.

N85-29569*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION MODELS, MOCKUPS AND SIMULATORS
Keith H. Miller and Alan Osgood *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 8 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Schematic outlines for space station models, mockups, and simulators are presented. The types of Boeing models, mockups, and simulators are given along with the classes and characteristics. The use of models in the 767 program is briefly given. Computerized human factors tools are outlined. The use of computer aided design and computer aided manufacturing in the approach for the space station is advocated. E.R.

N85-29570*# Lockheed Aircraft Corp., Burbank, Calif.
MOCKUPS AND HUMAN PRODUCTIVITY STUDIES
Tom Fisher *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 20 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Idea outlines are presented concerning mockup candidates, mockup utilization and schedules/sequence in mockup development. Mockup candidates which aid in human productivity investigations and assessment are given. Areas which are considered in the mockups are the safe haven zone, general purpose workstations, maintenance and servicing area, sleep quaters, multiple docking adapter, airlock, hygiene station, food station, habitation zones, group gathering area and lab areas. Some aesthetic concerns in human productivity are also given. E.R.

N85-29571*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXPERIENCES WITH NEUTRAL BUOYANCE TESTING MOCKUPS
Bob Dellacamera *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 9 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Contingency operations with neutral bouyancy simulation on a space platform is considered. Some task simulated are aft payload port deployment and retraction, removal and replacement of the control moment cyro, and deployment of the manual hand crank appendage. It is decided that crewmen can perform fine motor activities when simple aids are provided, certain tasks can be accomplished with less efforts when the crewman is afforded additional mobility, manual translation of large mass items is feasible, and that during the installation of replaceable units application of alignment indicators provide significant assistance to crewmen. E.R.

N85-29572*# Rockwell International Corp., Pittsburgh, Pa. Crew/Habitation Group.
ROCKWELL EXPERIENCE APPLICATIONS TO AMES SPACE STATION MOCKUP HABITABILITY/PRODUCTIVITY STUDIES
J. A. Roebuck *In* NASA. Ames Research Center Proc. of the Seminar on Space Station Human Productivity Mar. 1985 17 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

The use of Rockwell experiences to assist NASA/Ames with planning for space station mockup studies is outlined. Mockup lessons from Rockwell spacecraft studies are reviewed. Typical and unique mockup technology applications are illustrated. Potential uses for space station mockups are given along with the areas of concern. Workstation design requirements are given. E.R.

N85-29573*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE ROLE OF MOCK-UPS IN THE DEVELOPMENT OF ORBITAL REPLACEABLE UNITS (ORU)
Gary A. Johnson *In its* Proc. of the Seminar on Space Station Human Productivity Mar. 1985 26 p (For primary document see N85-29539 18-54)
Avail: NTIS HC A99/MF E03 CSCL 05H

Orbital Replaceable Units (ORU) is defined as any unit designed for replacement while in orbit. Two types are given. The number of ORU and the ratio of types is given as a function of the particular spacecraft. The purpose of the study is to develop and validate hardware design and operations for on orbit replacement of large modular ORU's. Two types of of testing are outlined; 1-G tests and neutral buoyancy tests. E.R.

N85-29574# California Univ., Livermore. Lawrence Livermore Lab. Biomedical and Environmental Research Program.
USE OF ENVIRONMENTAL HEALTH-RISK ANALYSIS FOR MANAGING TOXIC SUBSTANCES
Thomas E. McKone Mar. 1985 17 p refs Presented at the 78th Air Pollution Control Assoc. Ann. Meeting and Exhibition, Detroit, 16-21 Jun. 1985
(Contract W-7405-eng-48)
(DE85-008964; UCRL-92329; CONF-850612-1) Avail: NTIS HC A02/MF A01

A set of simple models used to assess health risks based on toxicity, environmental mobility and persistence is presented. These models use a representative landscape to describe the steady-state distribution of arsenic, tritiated water, and TCDD as a result of continuous additions to soil. The information is used to assess potential exposures. Application of the screening model to three chemically different carcinogens reveals that the environmental health risk does not scale with direct measures of toxicity. As estimated here, the environmental health risk of TCDD relative to tritiated water and arsenic is roughly an order of magnitude less than its cancer potency relative to these compounds. The difference is attributable in large part to the immobility of TCDD relative to tritium and the lower persistence of TCDD compared to arsenic. A simple procedure for using the relative behavior of toxic species under prototype conditions as a basis for risk management is presented. DOE

N85-29575# Interuniversitair Reactor Instituut, Delft (Netherlands). Stralingsbeschermingsdienst.
REPORT OF THE 11TH REGIONAL IRPA CONGRESS ON RECENT DEVELOPMENTS AND NEW TRENDS IN RADIATION PROTECTION [VERSLAG VAN HET XI REGIONALE IRPA KONGRES VAN 20-24 SEPTEMBER 1983 TE WENEN RECENT DEVELOPMENTS AND NEW TRENDS IN RADIATION PROTECTION]
W. F. Passchier Sep. 1983 12 p refs In DUTCH Congr. held in Vienna, 20-24 Sep. 1983
(IRI-190-83-13) Avail: NTIS HC A02/MF A01

International Atomic Energy Authority safety standards; non-ionizing radiation; radiation measurements and techniques; biology and medecine; dosimetry, and environmental effects were discussed. Author (ESA)

N85-29576# Interuniversitair Reactor Instituut, Delft (Netherlands). Stralingsbeschermingsdienst.
WORKING SAFELY WITH IONIZING RADIATION SOURCES AT THE INTERUNIVERSITY REACTOR INSTITUTE (IRI) (MEANT FOR THE INTRODUCTION OF NEW COLLABORATORS) [VEILIG WERKEN MET IONISERENDE-STRALINGSBRONNEN BIJ HET IRI (BESTEMD VOOR DE INTRODUKTIE VAN NIEUWE MEDEWERKERS)]
W. F. Passchier Jan. 1984 18 p In DUTCH
(IRI-190-84-01) Avail: NTIS HC A02/MF A01

Ionizing radiation (sources), its properties, potential dangers for human beings, animals and plants, and the protection measures to be taken against it are presented. Author (ESA)

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N85-29577# Naval Postgraduate School, Monterey, Calif.
THREE-DIMENSIONAL DATA DISPLAY ON THE TWO-DIMENSIONAL SCREEN M.S. Thesis
H. S. Hwang Dec. 1984 84 p
(AD-A153699; AD-F630675) Avail: NTIS HC A05/MF A01 CSCL 09/3

The difficulties encountered when implementating orthographic reprojection of 3-dimensional image data onto a 2-dimensional screen arise principally because of the size of data being manipulated and the tendency for underlying or overlying structures to obscure a clear view of the desired image. In this thesis, implementation was performed with an orthographic reprojection technique and many heuristic approaches were used to resolve some of the related problems. Of the several coordinate rotating algorithms tested, the Precalculation and Indexing algorithm proved to be the most efficient. Due to the disparity of the viewing-coordinate grids and the voxels of the volume data after rotation, 3-dimensional interpolation is required for applying the reprojection technique. Several methods implementing linear interpolation were tried. Interpolation with a cone-shape kernel is the most appropriate in the 2D situations and can be easily extended to a sphere-shape kernel in 3D situations. The othographic reprojection method includes a single plane dissection capability. Results on artificial test data are collected using the above algorithms. Several resulting images are included as well as the associated PASCAL programs. GRA

N85-29578# Naval Postgraduate School, Monterey, Calif. Dept. of Computer Science.
THE USE OF VLSI TECHNOLOGY FOR THE REAL-TIME GENER-

ATION OF GRAPHICS DISPLAYS: A PROPOSAL
Michael J. Zyda Mar. 1985 14 p refs
(AD-A153766; NPS52-85-003) Avail: NTIS HC A02/MF A01 CSCL 09/2

This study proposes to look at special purpose VLSI architectures for realtime display generation. The goal is the development of a methodology for taking a selected computer graphics algorithm and producing a silicon system that performs that algorithm. Several graphics algorithms that have the potential for VLSI implementation will be identified and studied. Part of this effort will be a characterization of the changes in the architecture of the graphics display system made necessary by the addition of such real-time display generation. GRA

N85-29579# Los Alamos Scientific Lab., N. Mex.
COPING WITH COMPUTER TERMINOLOGY
K. Wheeler 1985 4 p refs Presented at 32nd Ann. Intern. Tech. Commun. Conf., Houston, Tex., 19 May 1985
(Contract W-7405-eng-36)
(DE85-006076; LA-UR-85-129; CONF-850598-1) Avail: NTIS HC A02/MF A01

Methods employed in technical writing in the computer science field are discussed. A VAX computer running the VNIX operating system serves as an example. G.L.C.

N85-29580# Argonne National Lab., Ill. Mathematics and Computer Science Div.
TRADEOFFS AMONG PORTABILITY, COMPLEXITY, AND EFFICIENCY IN MULTIPROCESSING ENVIRONMENTS
E. L. Lusk and R. A. Overbeek 1985 17 p refs Presented at the Workshop on Parallel Processing Using the Heterogeneous Element Processor, Norman, Okla., 20 Mar. 1985
(Contract W-31-109-eng-38; Grant NSF MCS-82-07430)
(DE85-007899; CONF-8503117-1) Avail: NTIS HC A02/MF A01

The question of reconciling portability issues with the desire to capitalize on massive parallelism is investigated. A fairly straightforward (but prototypical) grid computation is studied. Three portable implementations suitable for use on multiprocessors are described: one was designed for a machine with a limited number of processors and a globally shared memory, one will function well on a machine with a large number of processors and a globally shared memory, and the last will port between a fairly wide variety of machines (including the Denelcor HEP, the CRAY-XMP, and hypercubes). For those grid computations that can capitalize on massive parallelism, it is possible to write code that will port straightforwardly between machines that do support a globally shared memory and those that do not. However, such portability does introduce some complexity into the actual formulation and implementation of an appropriate algorithm. DOE

N85-29581# National Bureau of Standards, Gaithersburg, Md. Inst. for Computer Sciences and Technology.
GUIDANCE ON PLANNING AND IMPLEMENTING COMPUTER SYSTEM RELIABILITY Final Report
Lynne S. Rosenthal Jan. 1985 53 p refs
(PB85-177996; NBS/SP-500/121) Avail: NTIS HC A04/MF A01; SOD HC $2.75 as 003-003-02628-0 CSCL 09B

This document is intended for the computer system manager (or user) responsible for the specification, measurement, evaluation, selection or management of a computer system. This report addresses the concepts and concerns associated with computer system reliability. Its main purpose is to assist system managers in acquiring a basic understanding of computer system reliability and to suggest actions and procedures which can help them establish and maintain a reliability program. The report presents discussion on quantifying reliability and assessing the quality of the computer system. Design and implementation techniques that may be used to improve the reliability of the system are also discussed. Emphasis is placed on understanding the need for reliability and the elements and activities that are involved in implementing a reliability program. Author (GRA)

N85-29582# National Bureau of Standards, Gaithersburg, Md. Systems and Network Architecture Div.
PERFORMANCE MEASUREMENT OF OSI (OPEN SYSTEM INTERCONNECTION) CLASS 4 TRANSPORT IMPLEMENTATIONS
Kevin L. Mills, Jeff W. Gura, and C. Michael Chernick Jan. 1985 53 p refs
(PB85-177657; NBSIR-85/3104) Avail: NTIS HC A04/MF A01 CSCL 09B

A measurement system to evaluate the performance of open system interconnection (OSI) transport protocol implementations is described. Several metrics are proposed to establish a quantitative characterization of layered protocol performance. Metrics specific to the OSI transport protocol are also proposed. The measurement system and metrics are applied to a multivendor national computer conference demonstration network and the results are reported. GRA

N85-29093# Joint Publications Research Service, Arlington, Va.
FRANCE'S USE OF CRAY 1, PLANS FOR NATIONAL SUPERCOMPUTER
Jean Deflaceliere *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-031) 11 Sep. 1985 p 25-26 Transl. into ENGLISH from Les Echos Ind. (Paris), 20 Jun. 1984 p 11 (For primary document see N85-29089 18-31)
Avail: NTIS HC A03/MF A01

N85-29903*# Pennsylvania Univ., Philadelphia. Dept. of Radiation Therapy.
SOLAR PHYSICS APPLICATIONS OF COMPUTER GRAPHICS AND IMAGE PROCESSING
Martin D. Altschuler *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 441-453 (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 09B

N85-29904*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GRAPHIC DISPLAYS OF VECTOR MAGNETIGRAPH DATA
Douglas M. Rabin and E. A. West *In its* Meas. of Solar Vector Magnetic Fields May 1985 p 454-466 (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 09B

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N85-29583# Wisconsin Univ., Madison. Mathematics Research Center.
A GLOBAL OPTIMIZATION ALGORITHM USING STOCHASTIC DIFFERENTIAL EQUATIONS Technical Summary Report
F. Aluffi-Pentini, V. Parisi, and F. Zirilli Feb. 1985 46 p
(Contracts DAAG29-80-C-0041; DAJA37-81-C-0740)
(AD-A153526; MRC/TSR-2791) Avail: NTIS HC A03/MF A01 CSCL 09/2

SIGMA is a set of FORTRAN subprograms for solving the global optimization problem, which implement a method founded on the numerical solution of a Cauchy problem for stochastic differential equations inspired by quantum physics. This paper gives a detailed description of the method as implemented in SIGMA, and reports on the numerical tests which have been performed while the SIGMA package is described in the accompanying algorithm. The main conclusions are that SIGMA performs very well on several hard test problems; unfortunately given the state of the mathematical software for global optimization it has not been possible to make conclusive comparisons with other packages. GRA

N85-29584# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
EVALUATION AND VALIDATION (E/V) TEAM PUBLIC REPORT, VOLUME 1 Interim Technical Report, 1 Oct. 1983 - 30 Sep. 1984
V. L. Castor 30 Nov. 1984 500 p
(DA Proj. AJP-O)
(AD-A153609; AFWAL-TR-85-1016-Vol-1) Avail: NTIS HC A21/MF A01 CSCL 14/2

The initial activities and accomplishments of the Evaluation and Validation (E&V) Team are reported. The purpose of the E&V Task, which is sponsored by the Ada Joint Program Office (AJPO), is to develop the techniques and tools which will provide a capability to perform assessment of Ada Programming Support Environments (APSEs) and to determine conformance of APSEs to the Common APSE Interface Set (CAIS). As this technology is developed, it is being made available to DOD components, industry and academia. As with all Ada-related activities, the widest possible participation in the E&V Task is encouraged. Author (GRA)

N85-29585# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
DEBUGGING DISTRIBUTED COMPUTATIONS IN A NESTED ATOMIC ACTION SYSTEM Ph.D. Thesis
S. Y. Chiu Dec. 1984 155 p
(Contracts N00014-75-C-0661; N00014-83-K-0125)
(AD-A153617; MIT/LCS/TR-327) Avail: NTIS HC A08/MF A01 CSCL 09/2

Concurrent and distributed programs are hard to debug. This thesis argues that structuring activities as nested atomic actions can make debugging such programs much like debugging traditional sequential programs. To support the argument, the author presents a method for debugging computations in the Argus language and system. Her method is applicable to other action systems since it depends only on the atomicity properties of actions. To debug a computation in our method, the user inspects a serial execution that is equivalent to the original computation. The debugging process involves two phases. In the first phase, the user examines pre- and poststates of actions to isolate the action that exposes the bug. In the second phase, the debugging system re-executes code to reproduce the details of the culprit action. The user can repeat this re-execution and can use standard break-and-examine tools on it to isolate the bug. This debugging system supports the method by saving a partial history when an action runs. This history consists mainly of recovery versions of objects. The system also timestamps the termination of actions so it can determine from the saved versions the values of objects in an action's pre- and poststates. The debugging system itself uses pre-states to repeat actions. This thesis presents the first detailed design that uses recovery versions and timestamps for debugging. Author (GRA)

N85-29586# Aeronautical Research Labs., Melbourne (Australia).
PROGRAM DISAS: A COMPUTER PROGRAM TO OBTAIN HARD-COPY PLOTS OF AN IMAGE DISPLAYED ON A VECTOR GRAPHICS DEVICE IN A LOCAL-AREA-NETWORK
R. Bateman Jan. 1985 32 p
(AD-A153643; ARL/SYS-TM-76) Avail: NTIS HC A03/MF A01 CSCL 09/2

Program DISAS is a program which supports the computer graphics facilities of Combat Effectiveness Group at ARL. It operates in a local-area-network incorporating a network of PDP22 minicomputers, a Sanders Graphic-7 vector graphics device and a Versatec electrostatic printer/plotter. Program DISAS produces hard-copy plots on the Versatec printer/plotter of a selected image displayed on the screen of the SANDERS Graphic-7 vector graphics device. A listing of the program can be obtained from the Principal Officer of Combat Effectiveness Group. GRA

N85-29587# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
REPLICATION METHODS FOR ABSTRACT DATA TYPES Ph.D. Thesis
M. P. Herlihy Jun. 1984 158 p
(Contract N00014-75-C-0661)
(AD-A153648; MIT/LCS/TR-319) Avail: NTIS HC A08/MF A01 CSCL 09/2

An advantage of distributed systems over centralized systems is that valuable data can be stored redundantly at multiple locations--a practice commonly called replication. Replication can enhance the availability of data in the presence of failures, increasing the likelihood that the data will be accessible when needed. This thesis introduces a new method for managing replicated data. We propose new techniques to address four problems associated with replication: the representation and manipulation of replicated data, concurrency control, on-the-fly reconfiguration, and enhancing availability in the presence of partitions. Unlike many methods that support replication only for uninterpreted files, our method makes use of type-specific properties of objects (such as sets, queues, or directories) to provide more effective replication. Associated with each operation of the data type is a set of quorums, which are collections of sites whose cooperation suffices to execute the operation. Analysis of the algebraic structure of the data type is used to derive a set of constraints on quorum intersections. Any choice of quorums that satisfies these constraints yields a correct implementation, and it can be shown that no smaller set of constraints guarantees correctness. By taking advantage of type-specific properties in a general and systematic way, our method can realize a wider range of availability properties, more concurrency, more flexible reconfiguration, and better tolerance of partitions than existing replication methods. GRA

N85-29588# Federal Compiler Testing Center, Falls Church, Va.
Ada VALIDATION SUMMARY REPORT. ALS AdaVAX VERSION 1.1 VAX-11/780 USING VAX/VMS RELEASE 3.6 Summary Report
31 Dec. 1984 27 p
(AD-A153684; OIT/FSTC-84/501) Avail: NTIS HC A03/MF A01 CSCL 09/2

Under U.S. Army Contract DAAK80-C-0507, SofTech, Incorporated has developed an Ada compilation system for the Department of the Army, Headquarters USA, Communications Electronic Command. The compiler, ALS AdaVAX version 1.25, was tested against version 1.4 of the Ada Compiler Validation Capability (ACVC) test suite on a VAX-11/780 operating under VAX/VMS version 3.6. Version 1.4 of the test suite contained 2185 tests, of which 1943 were applicable to this implementation. Of the applicable tests, 74 were withdrawn due to errors in the tests. Of the remaining applicable correct tests, all (1875) passed, and no anomaly was discovered. GRA

N85-29589# Naval Postgraduate School, Monterey, Calif.
AN INTERACTIVE COMPUTER AID FOR THE DESIGN AND ANALYSIS OF LINEAR, SINGLE INPUT/SINGLE OUTPUT DIGITAL AND CONTINUOUS CONTROL SYSTEMS M.S. Thesis
C. M. Cooksey Dec. 1984 130 p
(AD-A153704; AD-F630675) Avail: NTIS HC A07/MF A01 CSCL 09/2

This thesis discusses the development of the Digital and Analog Control System Analysis Program (DACSAP). DACSAP is an interactive computer aid for the design and analysis of linear, single input/single output feedback control systems. DACSAP is user friendly; it uses menus for option selection and prompted data entry. The program will analyze systems which are described by transfer functions written in the s, z, w or w' domains. The program will manipulate the transfer functions of multi-loop systems to produce the open and closed loop systems to produce the open and closed loop transfer functions required for a variety of analysis techniques. The analysis techniques included in DACSAP are root locus, open and closed loop Bode frequency response, Nyquist frequency response, Nicols frequency response and closed loop time response. The output of any of these analysis techniques may be either a tabulation of data points or a high resolution plot. GRA

N85-29590# Federal Compiler Testing Center, Falls Church, Va.
Ada (TRADEMARK) COMPILER VALIDATION SUMMARY REPORT. HONEYWELL INFORMATION SYSTEMS GCOS6 Ada VERSION 1.1 Final Report, 14 Dec. 1984 - 14 Dec. 1985
14 Dec. 1984 29 p Sponsored by Inst. for Defense Analysis.
(AD-A153746; OIT/FSTC-84/515) Avail: NTIS HC A03/MF A01 CSCL 09/2

The Honeywell Information Systems Compiler GCOS6 Ada version 1.1, for the DPS 6/95, DPS 6/75, DPS 6/45, microSystem 6/20 and microSystem 6/10 using GCOS6 MOD400, was tested with version 1.4 of the ACVC validation tests. Version 1.4 of the test suite contained 2185 tests, of which 2008 were applicable to this implementation. Of the applicable tests, 71 were withdrawn due to errors in the tests. Of the remaining applicable correct tests 1937 passed, and no anomaly was discovered. GRA

N85-29591# Industrieanlagen-Betriebsgesellschaft m.b.H., Ottobrunn (West Germany).
Ada COMPILER VALIDATION SUMMARY REPORT, UNIVERSITY OF KARLSRUHE-GMD/GERMAN MOD SIEMENS - BS 2000 VERSION 7.30 Final Report, 28 Nov. 1984 - 28 Nov. 1985
28 Nov. 1984 48 p Sponsored by Inst. for Defense Analysis
(AD-A153747) Avail: NTIS HC A03/MF A01 CSCL 09/3

The purpose of this Validation Summary Report (VSR) is to present the results and conclusions of performing standardized tests of the GMD/German MOD Compiler. On-Site testing was performed 27 Sep. 1984 to 8 Oct. 1984 at the GMD Center in Birlinghoven, Germany under the auspices of the Ada Validation Facility (AVF), according to the Ada Validation Office (AVO) policies and procedures. The GMD Compiler (Siemens 7.XXX Version 840404) is hosted on the Center's Siemens 7.571 Computer operating under BS2000 7.1. The suite of tests known as the Ada Compiler Validation Capability (ACVC), Version 1.4, was used. A complete list of tests and results is provided in this report. GRA

N85-29592# Bureau d'Orientation de la Normalisation en Informatique, Rocquencourt (France).
Ada (TRADEMARK) COMPILER VALIDATION SUMMARY REPORT: ALSYS ALSYCOMP-0001 Final Report, 8 Dec. 1984 - 8 Dec. 1985
8 Dec. 1984 25 p Sponsored by Inst. for Defense Analysis
(AD-A153750) Avail: NTIS HC A02/MF A01 CSCL 09/2

The purpose of this report is to document the results of the testing performed on the compiler, and in particular, to: identify any language constructs supported by the compiler that do not conform to the Ada standard; identify any unsupported language constructs required by the Ada standard; describe implementation-dependent behavior allowed by the standard. GRA

N85-29593# Boeing Aerospace Co., Seattle, Wash.
SPECIFICATION OF SOFTWARE QUALITY ATTRIBUTES, VOLUME 1 Final Report, Aug. 1982 - Oct. 1984
Thomas P. Bowen, Gary B. Wigle, and Jay T. Tsai Griffiss AFB, N.Y. RADC Feb. 1985 111 p 3 Vol.
(Contract F30602-82-C-0137; AF Proj. 2527)
(AD-A153988; D182-11678-Vol-1; RADC-TR-85-37-Vol-1) Avail: NTIS HC A06/MF A01 CSCL 09/2

The methodology and framework elements was developed to focus on an Air Force software acquisition manager specifying quality requirements for embedded software that is part of a command and control application. This methodology and most of the framework elements are generally useful for other applications and different environments. Volume 1 describes the results of research efforts conducted under this contract, including recommendations for integrating quality metrics technology into the Air Force software acquisition management process, recommended changes to Air Force software and acquisition documentation, and summaries of software quality framework changes and specification methodology features. GRA

N85-29594# Boeing Aerospace Co., Seattle, Wash.
SPECIFICATION OF SOFTWARE QUALITY ATTRIBUTES. VOLUME 2: SOFTWARE QUALITY SPECIFICATION GUIDEBOOK Final Report, Aug. 1982 - Oct. 1984
Thomas P. Bowen, Gary B. Wigle, and Jay T. Tsai Griffiss AFB, N.Y. RADC Feb. 1985 147 p 3 Vol.
(Contract F30602-82-C-0137; AF Proj. 2527)
(AD-A153989; D182-11678-Vol-2; RADC-TR-85-37-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 09/2

The methodology and framework elements was developed to focus on an Air Force software acquisition manager specifying quality requirements for embedded software that is part of a command and control application. Volume 2 and 3 describe the methodology for using quality metrics technology and include an overview of the software acquisition process using this technology and the quality frame work. Volume 2 describes methods for specifying software quality requirements and addresses the needs of the software acquisition manager. Volume 2 also describes procedures and techniques for specifying software quality requirements in terms of quality factors and criteria. Factors interrelationships, relative costs to develop high quality levels, and an example for a command and control application are also described. Procedures for assessing compliance with specified requirements are included. GRA

N85-29595# Boeing Aerospace Co., Seattle, Wash.
SPECIFICATION OF SOFTWARE QUALITY ATTRIBUTES. VOLUME 3: SOFTWARE QUALITY EVALUATION GUIDEBOOK Final Report, Aug. 1982 - Oct. 1984
Thomas P. Bowen, Gary B. Wigle, and Jay T. Tsai Griffiss AFB, N.Y. RADC Feb. 1985 302 p 3 Vol.
(Contract F30602-82-C-0137; AF Proj. 2527)
(AD-A153990; D182-11678-Vol-3; RADC-TR-85-37-Vol-3) Avail: NTIS HC A14/MF A01 CSCL 09/2

The methodology and framework elements was developed to focus on an Air Force software acquisition manager specifying quality requirements for embedded software that is part of a command and control application. This methodology and most of the framework elements are generally useful for other applications and different environments. Volume 3 describes methods for evaluating achieved quality levels of software products and addresses the needs of data collection and analysis personnel. Volume 3 also describes procedures and techniques for evaluating achieved quality levels of software products. Worksheets for collecting metric data by software lifecycle phase and score sheets for scoring each factor are provided in the appendixes. Detailed metric questions are nearly identical to questions in the Software Evaluation Reports proposed as part of the Software Technology for Adaptable Reliable Systems (STARS) Measurement data item descriptions. GRA

N85-29596# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
GRAPHICS PACKAGE, VERSION 4: USER REFERENCE MANUAL
James D. Sullivan Dec. 1984 109 p
(Contract DE-AC02-78ET-51013)
(DE85-007894; DOE/ET-51013/132; PFC/RR-84-14) Avail: NTIS HC A06/MF A01

This manual provides the technical information that a FORTRAN programmer needs to write graphics computer programs. The purpose of this graphics package is to provide an internally consistent, easy-to-use set of graphic subprograms for making publication style plots and illustrations on a variety of display devices. The descriptions in this chapter give an introduction to simple plotting. The intent has been to present an overview in the hope that, with an idea of what is going on, more general methods will be easier to learn. DOE

N85-29597# California Univ., Livermore. Lawrence Livermore Lab.
MICRO-CAE MECHANICAL ENGINEERING SOFTWARE DEVELOPMENT AT LAWRENCE LIVERMORE NATIONAL LABORATORY AND PARTICIPATING UNIVERSITIES AND TECHNOLOGY TRANSFER
William Comfort, III and Billy David (Northern Arizona Univ.,

Flagstaff) 8 Feb. 1985 6 p refs
(Contract W-7405-eng-48)
(DE85-008880; UCID-20364) Avail: NTIS HC A02/MF A01

A concept in Microcomputer-Aided Engineering has evolved and matured at Lawrence Livermore National Laboratory during the past 4 years. In harmony with the goals of the project, several universities are participating in the development of software which will be useful both to engineering colleges and to practicing engineers. The goals of the project are that of developing, collecting, and/or converting approximately 40 software packages, and transfering Micro-CAE technology/software to universities. Micro-CAE is defined as the use of special purpose microcomputer graphics-augmented software, invoked for the purpose of aiding engineers in modeling physical events and designing systems. The software is further characterized by user-system interactiveness, high degree of system friendliness, and heavy dependence on automatic graphics interpretation. The software will be made available to any university for instructional purposes at a cost of no more than what it costs to reproduce the diskettes and documentation. The software will be made available to run under CP/M and MS-DOS operating systems. DOE

N85-29598# California Univ., Livermore. Lawrence Livermore Lab.
PARALLEL COMPUTATION OF MULTIPLE-SCALE PROBLEMS, REVISION 1
R. C. Y. Chin, G. W. Hedstrom, J. R. McGraw, and F. A. Howes (California Univ., Davis) 1 Mar. 1985 17 p refs Presented at the ARO Workshop on New Computing Environments: Parallel, Vector and Systolic, Stanford, Calif., 7-9 Nov. 1984
(Contract W-7405-eng-48; Grant NSF DMS-83-19783)
(DE85-009447; UCRL-92007-Rev-1; CONF-8411140-3-Rev-1) Avail: NTIS HC A02/MF A01

The efficient use of multiprocessor computers requires the introduction of new numerical algorithms. The identification by asymptotic analysis of concurrencies inherent in the governing equations of multiple scale problems is a good way to develop such algorithms. The language used must be able to maintain these concurrencies. Depending on the problem and the computer, this concurrency may not be sufficient to keep all the processors busy, and the language must be able to identify additional concurrencies. These ideas are illustrated based on a convection-diffusion equation. DOE

N85-29599# Oak Ridge National Lab., Tenn.
INTRODUCTION TO PROGRAMMING MULTIPLE-PROCESSOR COMPUTERS
H. R. Hicks and V. E. Lynch Apr. 1985 24 p refs
(Contract DE-AC05-84OR-21400)
(DE85-010274; ORNL/TM-9493) Avail: NTIS HC A02/MF A01

The FORTRAN applications programs can be executed on multiprocessor computers in either a unitasking or multitasking form. The latter allows a single job to use more than one processor simultaneously, with a consequent reduction in wall-clock time and, perhaps, the cost of the calculation. An introduction to this programming is presented. The concepts of synchronization and data sharing using EVENTS and LOCKS are illustrated. The strategy of strong synchronization and the use of synchronization templates are proposed. We emphasize that incorrect multitasking programs can produce irreproducible results, which makes debugging more difficult. DOE

N85-29600# Colorado Univ., Boulder. Dept. of Computer Science.
ODIN: AN EXTENSIBLE SOFTWARE ENVIRONMENT. REPORT AND USER'S REFERENCE MANUAL
Geoffrey M. Clemm Dec. 1984 79 p refs
(Contract DE-AC02-80ER-10718)
(DE85-008459; DOE/ER-10718/1) Avail: NTIS HC A05/MF A01

The purpose of the Odin System is to provide an extensible program development environment. In Odin, a standard hierarchical file system is extended by the addition of user specified file types and user specified operations defined in terms of those file types. User operations are implemented through sequences of host system commands. Two languages are provided: an object oriented command language, and a specification language to allow the easy addition of new file types and operations. The user maintains in the host file system only those files that will be modified directly - the results of all operations are maintained within the Odin System. DOE

N85-29601# California Univ., Livermore. Lawrence Livermore Lab.
SCATTERED DATA INTERPOLATION CODES
Thomas A. Foley (Arizona State Univ.) 11 Feb. 1985 26 p refs
(Contract W-7405-eng-48)
(DE85-007337; UCID-20345) Avail: NTIS HC A03/MF A01

During the past decade, several scattered data interpolation codes have been developed that solve the following problem: given N points (x sub i, y sub i, z sub i), construct a smooth bivariate function F(x,y) that satisfies F(x sub i, y sub i) = z sub i for i = 1,...,N. There appears to be no one code that will effectively solve this problem on all of the data sets encountered by this author. Some methods, such as Hardy's multiquadric method, work extremely well on smooth, accurate, and reasonably distributed data like those in Franke. However, this method is inefficient for large values of N and ineffective on some track data. The purpose of this report is to describe the set of subroutines available in INTER2V that will effectively handle most scattered data problems. DOE

N85-29602# Research Inst. of National Defence, Stockholm (Sweden). Dept. 2.
A COMPUTER CODE IB-KB FOR INTERIOR BALLISTICS OF RECOILING AND RECOILLESS GUNS
Sven-Erik Flygar Jan. 1985 65 p refs In SWEDISH; ENGLISH summary
(FOA-C-20566-D2; ISSN-0347-3694) Avail: NTIS HC A04/MF A01; Research Institute of National Defence, Stockholm KR 50

Firing laws for recoiling and recoilless guns; firing law for incorporated form function; equations of motion; pressure conditions in a recoilless gun; energy equations; recoil speed; recoil force; gunpowder erosion in recoilless guns; computation of static, mean, and stagnation pressure; delayed firing calculations; friction of the gunpowder gases against the gun tube wall; air resistance in the gun tube; program structures; input of data; and output of data are discussed. Author (ESA)

N85-29603# Norsk Data A.S., Oslo. A/S Informasjonskontroll.
THE MULTIPLE PROCESSOR MACHINE FOR IMAGE PROCESSING, VOLUME 5 Executive summary
Paris ESA 28 Mar. 1984 16 p 5 Vol.
(Contract ESA-5420/83/NL-PP(SC))
(ESA-CR(P)-1976-Vol-5) Avail: NTIS HC A02/MF A01

The load analysis, software, and development of a multiprocessor for synthetic aperture radar (SAR) and the use of off the shelf equipment are discussed. The algorithms for processing SAR images from raw data are described. The processing load in terms of arithmetic operations, the necessary memory sizes, and transfer rates is estimated. The system and development software for the CESAR multiprocessor system are described. Machine considerations, high order language for CESAR (based on Pascal), operating system, communication protocols, linking and loading, debugging and reliability, and reconfiguration capabilities are highlighted. The CESAR configurations to meet the SAR processing specifications are considered, based on SVOP and MARS 432 processors. The MARS 432 fits very well in the CESAR system. However, the SVOP can be used in a modular, flexible system of CESAR. Author (ESA)

N85-29604*# Technische Hogeschool, Delft (Netherlands). Dept. of Mathematics and Information.
Ada DEVELOPMENTS [ONTWIKKELINGEN ROND ADA]
J. vanKatwijk 1984 46 p refs In DUTCH
(Rept-84-28) Avail: NTIS HC A03/MF A01

Worldwide developments around the programming language Ada are discussed. Structuring and data structures in the Ada subset are described. Author (ESA)

N85-29605# Technische Hogeschool, Delft (Netherlands). Afd. der Luchtvaart- en Ruimtevaarttechniek.
COMPUTER PROGRAM FOR THE CONTROL/OPERATING SYSTEM OF THE GAS FLOW INSTALLATION FOR THE SOLID FUEL COMBUSTION CHAMBER [COMPUTERPROGRAMMA VOOR HET REGEL/BEDIENINGSSYSTEEM VAN DE GASTOEVOERINSTALLATIE VOOR DE VASTE BRANDSTOF VERBRANDINGSKAMER]
R. J. vanderWal, P. A. O. G. Korting, and H. F. R. Schoeyer Jul. 1984 121 p refs In DUTCH Sponsored by Stichting voor de Technische Wetenschappen, Projektbureau Energie-Onderzoek, Technische Hogeschool, Delft, and Pring Maurits Lab. TNO
(VTH-LR-430; PML-1984-C57; SFCC-Publ-14) Avail: NTIS HC A06/MF A01

The program of a microprocessor controling the sequence of events during an experiment with a solid fuel combustion chamber is explained. Program listings are given. Author (ESA)

N85-29606# Technische Hogeschool, Delft (Netherlands). Afd. der Luchtvaart-en Ruimtevaarttechniek.
A MODEL FOR THE COMBUSTION OF POLYMETHYL METHACRYLATE IN AIR IN A LAMINAR DIFFUSION FLAME [EEN MODEL VOOR DE VERBRANDING VAN POLYMETHYL METHACRYLAAT IN LUCHT IN EEN LAMINAIRE DIFFUSIE VLAM]
J. J. T. Koas Aug. 1984 206 p refs In DUTCH; ENGLISH summary Sponsored by Stichting voor de Technische Wetenschappen, Projektbureau Energie-Onderzoek, Technische Hogeschool, Delft and Prins Maurits Lab. TNO
(VTH-LR-439; PML-1984-C75; SFCC-Publ-17) Avail: NTIS HC A10/MF A01

A numerical solution of a set of parabolic nonlinear partial differential equations describing the steady state axisymmetric laminar flow field of a PMMA-candle in air combustion is presented. The pyrolyse of PMMA is described and a simple model for the combustion of PMMA-pyrolyse products in air is presented. Assuming a simplification similar to Prandtl's boundary layer, equations for the conservation of momentum in axial direction, for the conservation of energy, and the conservation of fuel and oxydizer species result. For the numerical solution a computer program which uses an unconditionally stable implicit finite difference method was developed. Comparison of numerical and experimental results shows that the model predicts the flow field fairly well. Author (ESA)

N85-29607# National Bureau of Standards, Gaithersburg, Md. Inst. for Computer Sciences and Technology.
ANNOTATED BIBLIOGRAPHY OF RECENT PAPERS ON SOFTWARE ENGINEERING ENVIRONMENTS Final Report
Raymond C. Houghton, Jr. and Dolores R. Wallace Apr. 1985 25 p refs
(PB85-191385; NBSIR-85/3113) Avail: NTIS HC A02/MF A01 CSCL 09B

Abstracts are presented for fifty-five recent papers on software engineering environments. Several of these papers present an overview of software engineering environments. Other papers discuss issues to be considered in building software engineering environments. The remaining papers describe general software engineering environments, system development environments, and programming environments. GRA

N85-29099# Joint Publications Research Service, Arlington, Va.
MBB EXPANDS CADAM SYSTEM FOR A 320 PROGRAM
In its West Europe Rept.: Sci. and Technol. (JPRS-WST-84-032) 25 Sep. 1984 p 23-24 Transl. into ENGLISH from Flug Rev. (Stuttgart), Aug. 1984 p 82-83 (For primary document see N85-29095 18-31)
Avail: NTIS HC A03/MF A01

62 COMPUTER SYSTEMS

Includes computer networks.

N85-29608 CIAD, Zoetermeer (Netherlands).
TWO-DIMENSIONAL/SPEED/COUPLE/DATA BASE MANAGEMENT SYSTEM [2D/SNELHEID/KOPPEL/DBMS]
1984 22 p In DUTCH
(A-1) Copyright. Avail: Issuing Activity

A program to test computer aided design (CAD) systems is described. After the construction of a base figure, manipulations, transformations, reflections, rotations, reductions, and rescalings are executed. Line strings, edgings, parameterized forms, accuracy, speed, and data base efficiency are tested. Coupling possibilities with FORTRAN programs and data base management are investigated. Author (ESA)

N85-29609 CIAD, Zoetermeer (Netherlands).
THREE-DIMENSIONAL/INTEGRATION TWO AND THREE DIMENSIONAL/NUMERICAL CONTROL/COMMUNICATION [HET 3D/INTEGRATIE 2D-3D/NC/COMMUNICATIE]
1984 27 p In DUTCH
(A-2; ISBN-90-6818-001-0) Copyright. Avail: Issuing Activity

A program to test computer aided design (CAD) systems is described. After the construction of three dimensional base elements, a composition of the elements, a three dimensional model of a strip, and special orders dealing with it, are executed. The integration of two and three dimensional systems, numerical control, and the communication with other CAD systems by means of IGES version 1.0 are tested. Author (ESA)

N85-29610 CIAD, Zoetermeer (Netherlands).
THE CEADS-CADD SYSTEM [HET CEADS-CADD SYSTEEM]
J. J. Duivenvoorden 1984 26 p In DUTCH
(A-4; ISBN-90-6818-004-5) Copyright. Avail: Issuing Activity

The CEADS-CADD computer aided design system, containing a HP1000 Model 6 based on a A600 microprocesser with a 512 Kb internal memory, a HP 2625 graphic black/white terminal a 16,5 Winchester disk drive with a built-in tape-unit, an A-1 plotter (HP 7580) 60 cm/sec, 8 pencils, and the CEADS/CADD software of Holguin is tested. After the construction of a base figure, manipulations, transformations, reflections, rotations, reductions, and rescalings are executed. Linestrings, edgings, parameterized forms, accuracy, design speed, and the coupling possibilities with FORTRAN are investigated. Although a relatively small system with limited facilities (linestrings are lacking) is tested, results are good. Author (ESA)

N85-29611 CIAD, Zoetermeer (Netherlands).
SYSTEM TEST CALMA DDM (DESIGN DRAFTING MANUFACTURING) [SYSTEEMTEST CALMA]
J. J. Duivenvoorden 1984 40 p In DUTCH
(A-5; ISBN-90-6818-005-3) Copyright. Avail: Issuing Activity

A CALMA DDM (design drafting manufacturing) computer aided design system, containing a CALMA 7000 with a VAX 780 CPU, a VMS operating system, and a graphics and alphanumerical screen, was tested. After the construction of a base figure, manipulations, transformations, reflections, rotations, reductions, and rescalings are executed. Linestrings, edgings, parameterized forms, accuracy, draft speed, and data base efficiency are tested. Using design and analysis language, coupling possibilities with FORTRAN are investigated. For testing the data base management, the Process and Instrumentation Diagrams package is used. Three dimensional base elements, a composition of the elements, a three dimensional model of a ship, and special orders dealing with it are constructed. The integration of two and three dimensional systems, numerical control, and the communication with other CAD systems, by means of IGES, are investigated. Apart from word processing, wire models, and computing time, results are good. Author (ESA)

N85-29612 CIAD, Zoetermeer (Netherlands).
THE INTERNATIONAL COMPUTERS LIMITED (ICL) PERQ

1/ENGINEERING ARCHITECTURAL GRAPHICS LANGUAGE ENVIRONMENT (EAGLE) COMPUTER AIDED DESIGN SYSTEM (CAD) [HET ICL PERQ 1/EAGLE CAD-SYSTEEM]
J. J. Duivenvoorden and P. vanSchaijk 1984 28 p In DUTCH (A-7; ISBN-90-6818-006-1) Copyright. Avail: Issuing Activity

The ICL PERQ 1/EAGLE CAD system containing an ICL PERQ 1 workstation (16 bits with 1 Mbyte internal memory, a 24 Mb Winchester disk), a Benson 1333 plotter, and EAGLE two and three dimensional software is tested. After the construction of a base figure, manipulations, transformations, reflections, rotations, reductions, and rescalings are executed. Linestrings, edgings, parameterized forms, accuracy, design speed and data base efficiency are tested. Coupling possibilities with FORTRAN and data base management are investigated. Three dimensional base elements, a composition of the elements, a three dimensional model of a ship, and special orders dealing with it, are executed. Strong points are: PERQ-workstation, the A-4 screen, the three dimensional manipulations, and its piping applications. Weak points are: hatching, disk noise, and the positioning of the text.
Author (ESA)

N85-29613 CIAD, Zoetermeer (Netherlands).
SYSTEM TEST: HEWLETT-PACKARD DRAFT [SYSTEEMTEST HP-DRAFT]
J. J. Duivenvoorden and B. Luttikhuizen 1984 23 p In DUTCH (A-9; ISBN-90-6818-007-X) Copyright. Avail: Issuing Activity

The HP-Draft computer aided design system containing an HP 9836 CS workstation with a Motorola 68000 microprocessor, a 32 bits CPU, two floppy disk drives, an HP 13279 B color monitor, an HP 9111 A graphic tablet, a HP 9134 A Winchester disk, HP 7580 B AL plotter, and HP 9836 software, is tested. After the construction of a base figure, manipulations, transformations reflections, rotations, reductions, and rescalings are executed. Linestrings, edgings, parametrical forms, accuracy, design speed and data base efficiency are tested. Strong points are its simplicity, numerical control coupling possibilities, and the interaction between the menutablet and the screen. Weak points are hatching, few linetypes, reflecting and rotation, and coupling possibilities with existing systems.
Author (ESA)

N85-29614 CIAD, Zoetermeer (Netherlands).
TEST DRAWING OFFICE GRAPHICS SYSTEM (DOGS)/APOLLO [TEST DOGS/APOLLO]
J. J. Duivenvoorden and P. vanSchaijk 1984 28 p In DUTCH (A-10; ISBN-90-6818-008-8) Copyright. Avail: Issuing Activity

The DOGS/APOLLO computer aided design system containing DOGS 2D design software, Apollo Domain DN 300 hardware, and a Hewlett-Packard HP-7580 B plotter, is tested. After the construction of a base figure, manipulations, transformations, reflections, rotations, reductions, and rescalings are executed. Linestrings, edgings, parameterized forms, accuracy, design speed, and data base efficiency are tested. Coupling possibilities with FORTRAN programs and data base management are investigated. Strong points are simple input, hatching, text manipulations, data base management, a comfortable workstation, and network facilities. Weak points are slowness and the lack of splines and linestrings.
Author (ESA)

N85-29615# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
INEL USER NETWORK EXCHANGE, VOLUME 1-85, JAN./FEB. 1985
T. I. Williams, ed. Jan. 1985 22 p
(Contract DE-AC07-76ID-01570)
(DE85-006108; EGG-IS-6494(1-85)) Avail: NTIS HC A02/MF A01

This newsletter, of interest to users of the INEL network, contains items of general interest, equipment modifications, business systems descriptions, and software products notes. The contents relate to the computerized dessimation of information.
DOE

N85-29616# Sandia Labs., Albuquerque, N. Mex. Instrumentation Development Div.
A STORED DATA ACQUISITION SYSTEM: UPDATE
Steven N. Greene and Gene C. Hauser Mar. 1985 29 p ref
(Contract DE-AC04-76DP-00789)
(DE85-010534; SAND-84-2322) Avail: NTIS HC A03/MF A01

Sandia National Laboratories has developed, and continues to improve and modify, a simple, low power, inexpensive data acquisition system that retains collected data in semiconductor memory rather than telemetering them in real time; data are retrieved after the test unit is recovered. The system monitors and digitizes up to eight analog inputs. A microprocessor controls the device, thus making it adaptable to different data acquisition tasks.
DOE

N85-29617# Argonne National Lab., Ill. Mathematics and Computer Science Div.
DISTRIBUTION OF MATHEMATICAL SOFTWARE VIA ELECTRONIC MAIL
Jack J. Dongarra and Eric Grosse (Bell Telephone Labs., Inc., Murray Hill, N.J.) Mar. 1985 9 p refs
(Contract W-31-109-eng-38)
(DE85-009664; ANL/MCS-TM-48) Avail: NTIS HC A02/MF A01

A large collection of mathematical software is now available via electronic mail. Messages sent to netlib at anl-mcs (on the Arpanet/CSNET) or to research netlib (on the UNIX network) wake up a server that distributes items from the collection. For example the online message, send index, gets a library catalog by return mail. The service and some of the issues in its implementation.
DOE

N85-29618# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna. Inst. fuer Elektronik.
SAFETY SYSTEM WITH MICROCOMPUTER
Wolfgang Kloesch Aug. 1984 19 p refs In GERMAN; ENGLISH summary
(OEFZS-4294; EL-77/84) Avail: NTIS HC A02/MF A01

A safety system equipped with the microprocessor system Z-80 for a dosimetry laboratory is described. The system controls all relevant laboratories and working places, and the irradiation apparatus. The work sequences take place according to safety requirements imposed by the radiation protection agent. The principals of the microprocessor system hardware (central processing unit, parallel input-output, serial input-output) are explained. Assembler is chosen as programming language.
Author (ESA)

N85-29619# Societe Crouzet, Valence (France).
INVESTIGATION AND CONSTRUCTION OF THE MINI REMOTE TERMINAL UNIT (mRTU-M) ANALOG PROCESSOR MODULE (AP-M), VOLUME 1 Final Report [ETUDE ET REALISATION MRTUM AP-M, VOLUME 1]
M. Duban Paris ESA Dec. 1983 66 p In FRENCH Revised Original contains color illustrations 2 Vol.
(Contract ESA-4560/80/NL-HP)
(MR-DS-01-Vol-1; ESA-CR(P)-1961-Vol-1) Avail: NTIS HC A04/MF A01

A mini remote terminal unit module (RT-M) compatible with ESA onboard data handling (OBDH) specifications was developed for application in OBDH systems as an mRTU or as the central core of an RTU or intelligent terminal unit. The mRTU-Ms can be used at any bit rate up to the standard OBDH bus maximum of 550 Kbps.
Author (ESA)

N85-29620# Societe Crouzet, Valence (France).
INVESTIGATION AND CONSTRUCTION OF THE MINI REMOTE TERMINAL UNIT (mRTU-M), ANALOG PROCESSOR MODULE (AP-M), VOLUME 2 Final Report [ETUDE ET REALISATION MRTUM AP-M, VOLUME 2]
M. Duban Paris ESA Dec. 1983 142 p refs In FRENCH Revised Original contains color illustrations 2 Vol.
(Contract ESA-4560/80/NL-HP)
(MR-DS-01-Vol-2; ESA-CR(P)-1961-Vol-2; MR-ST-01) Avail: NTIS HC A07/MF A01

A mini remote terminal unit module (RT-M) compatible with ESA onboard data handling (OBDH) specifications was developed for application in OBDH systems as an mRTU or as the central core of an RTU or intelligent terminal unit. The design provides for double access to the redundant OBDH bus (via external coupling transformers) and for simple and flexible user, or using sybsystem, telemetry and command interfacing, via the extension bus (parallel address lines, samplings, clocks and data). The mRTU-M is analog processor module compatible. The use of gate arrays and hermetically sealed leadless chip carriers mounted on a multilayer ceramic substrate results in a high reliability, low power consumption, compact and light-weight 84 pin, plug-in package (30 g : 68 x 53 x 3 mm). Acquisition modes include analog 8 and 16-bit serial digital, and bilevel. Distribution modes include memory load, and four types of sampling commands. For each mode the capacity can be expanded up to 256 channels, except for memory loads (7 expandable up to 28). The mRTU-Ms can be used at any bit rate up to the standard OBDH bus maximum of 550 Kbps.
Author (ESA)

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N85-29621# Kling-Lindquist, Inc., Philadelphia, Pa.
DIRECT DIGITAL CONTROL STUDY
Feb. 1985 81 p
(Contract DACA87-82-D-0036)
(AD-A153685; HNDSP-85-105-ED-ME) Avail: NTIS HC A05/MF A01 CSCL 09/3

The purpose of this report is to describe the state-of-the-art of direct digital control (DDC) system technology that monitors and controls mechanical and electrical systems found in Government facilities. A DDC system can operate either as a stand-alone control system or as an extension to an Energy Monitoring and Control System (EMCS). Direct digital control systems are self-contained computer based systems which monitor and control processes in accordance with predetermined strategies. This report addresses the commercial-type DDC systems, in which sensors and controls are connected to a control panel. Control devices are modulated directly by the DDC system in accordance with established algorithms. Unlike industrial-type DDC systems, commercial-type DDC systems do not have a specific address for each control point position. GRA

N85-29622# Oak Ridge National Lab., Tenn. Engineering Physics and Mathematics Div.
HYBRID UNCERTAINTY THEORY
E. M. Oblow 13 May 1985 9 p refs Presented at the 5th Intern. Workshop on Expert Systems and Their Appl., Avignon, France, 13 May 1985
(Contract DE-AC05-84OR-21400)
(DE85-008357; CONF-8505117-1) Avail: NTIS HC A02/MF A01

A hybrid uncertainty theory for artificial intelligence problems combining the strengths of fuzzy-set theory and Dempster/Shafer theory is presented. The basic operations for combining uncertain information are given with an indication of their applicability in expert systems and robot planning problems. DOE

N85-29623# MATRA Espace, Paris-Velizy (France).
STANDARD GENERIC APPROACH FOR SPACECRAFT AUTONOMY AND AUTOMATION, PHASE 2 (SGASA-2). VOLUME 1: EXECUTIVE SUMMARY Final Report
J. Boissieres, R. Havas, A. Nilson, J. Sotta, D. Villain, R. D. Auer, H. Hoelzl, M. Langemann, H. Reffel, and R. Okert Paris ESA 1985 30 p 3 Vol.
(Contract ESTEC-5388/83/NC-PP)
(ESA053-1-Vol-1; ESA-CR(P)-1962-Vol-1) Avail: NTIS HC A03/MF A01

An executive summary of the needs of on-board automation and a generic approach for the design and exploitation of more autonomous spacecraft is presented. Autonomy requirements were established through analysis of mission scenarios for Earth observation from a Sun synchronous orbit; a large automatic platform in low Earth orbit; a telecommunication mission in geostationary orbit; and a deep space scientific mission. G.L.C.

N85-29624# MATRA Espace, Paris-Velizy (France).
STANDARD GENERIC APPROACH FOR SPACECRAFT AUTONOMY AND AUTOMATION, PHASE 2 (SGASA-2). VOLUME 2: TECHNICAL REPORT Final Report
J. Boissieres, R. Havas, A. Nilson, J. Sotta, D. Villain, R. D. Auer, H. Hoelzl, M. Langemann, H. Reffel, and R. Okert Paris ESA 1985 373 p 3 Vol.
(Contract ESTEC-5388/83/NC-PP)
(ESA053-1-Vol-2; ESA-CR(P)-1962-Vol-2) Avail: NTIS HC A16/MF A01

The needs of on-board automation are identified and a generic approach for the design and exploitation of more autonomous spacecraft is proposed. Autonomy requirements were established through analysis of mission scenarios for Earth observation from a Sun synchronous orbit; a large automatic platform in low Earth orbit; a telecommunication mission in geostationary orbit; and a deep space scientific mission. A hierarchical and decentralized system structure to limit failure propagation, simplify interfaces and to get a predictable system; organization of on-board management in terms of routine, crisis and end-product management; and autonomous orbit determination and control are suggested. A system architecture that defines the functional tasks of the ground control center, the on-board management system and the on-board subsystems and payloads is outlined. The operational relationships between these three parts are integrated in a general model of operating modes that covers routine and crisis phases. Author (ESA)

N85-29625# MATRA Espace, Paris-Velizy (France).
STANDARD GENERIC APPROACH FOR SPACECRAFT AUTONOMY AND AUTOMATION, PHASE 2 (SGASA-2). VOLUME 3: APPENDICES Final Report
J. Boissieres, R. Havas, A. Nilson, J. Sotta, D. Villain, R. D. Auer, H. Hoelzl, M. Langemann, H. Reffel, and R. Okert Paris ESA 1985 363 p refs 3 Vol.
(Contract ESTEC-5388/83/NC-PP)
(ESA053-1-Vol-3; ESA-CR(P)-1962-Vol-3) Avail: NTIS HC A16/MF A01

Specific appendices to the program to determine the needs of on-board automation and a generic approach for the design and exploitation of more autonomous spacecraft are presented. G.L.C.

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N85-29626*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INTERMEDIATE BOUNDARY CONDITIONS FOR LOD, ADI AND APPROXIMATE FACTORIZATION METHODS
Randall J. LeVeque Mar. 1985 26 p refs
(Contract NAS1-17070)
(NASA-CR-172591; ICASE-85-21; NAS 1.26:172591) Avail: NTIS HC A02/MF A01 CSCL 12A

A general approach to determining the correct intermediate boundary conditions for dimensional splitting methods is presented. The intermediate solution U is viewed as a second order accurate approximation to a modified equation. Deriving the modified equation and using the relationship between this equation and the original equation allows us to determine the correct boundary conditions for U*. This technique is illustrated by applying it to

locally one dimensional (LOD) and alternating direction implicit (ADI) methods for the heat equation in two and three space dimensions. The approximate factorization method is considered in slightly more generality. E.A.K.

N85-29627*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SHOCK CAPTURING
Stephen F. Davis Apr. 1985 24 p refs
(Contract NAS1-17070)
(NASA-CR-172592; ICASE-85-25; NAS 1.26:172592) Avail: NTIS HC A02/MF A01 CSCL 12A

Recent developments which have improved the understanding of how finite difference methods resolve discontinuous solutions to hyperbolic partial differential equations are discussed. As a result of this understanding improved shock capturing methods are currently being developed and tested. Some of these methods are described and numerical results are presented showing their performance on problems containing shocks in one and two dimensions. A conservative difference scheme is defined. Conservation implies that, except in very special circumstances, shocks must be spread over at least two grid intervals. These two interval shocks are actually attained in one dimension if the shock is steady and an upwind scheme is used. By analyzing this case, the reason for this excellent shock resolution can be determined. This result is used to provide a mechanism for improving the resolution of two dimensional steady shocks. Unfortunately, this same analysis shows that these results cannot be extended to shocks which move relative to the computing grid. Total variation diminishing (TVD) finite difference schemes and flux limiters are introduced to deal with money shocks and contact discontinuities. B.W.

N85-29628# Texas A&M Univ., College Station. Dept. of Electrical Engineering.
[RESEARCH ON SIGNAL DETECTION AND BLOCK TRUNCATION COOLING FOR IMAGE COMPRESSION] Interim Progress Report, 1 Jan. - 31 Dec. 1984
Don Halverson Jan. 1985 12 p
(Grant AF-AFOSR-0033-82)
(AD-A153444; AFOSR-85-0299TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

A number of results were obtained pertaining to signal detection and data compression for image processing. These results led to improved performance over previous approaches, with special attention given to methods which required less statistical knowledge and which were easier to implement. In particular, robustness and nonparametric techniques were employed to allow the exploitation of whatever knowledge was available, while retaining insensitivity to the remaining inexactness in knowledge. In addition, because the presence of dependency in the underlying random processes often complicates detector design, investigations into when weak dependency could be ignored were undertaken; moreover, results were obtained pertaining to the general subject of the extent of variation (induced by incomplete knowledge of the dependency) in the form of the detector data processor. Finally, some results were obtained which allowed relaxing stationarity assumptions which were placed on the signal in earlier work. Author (GRA)

N85-29629# Yale Univ., New Haven, Conn. Dept. of Computer Science.
SOLVING ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS ON THE HYPERCUBE MULTIPROCESSOR
Tony F. Chan, Youcef Saad, and Martin H. Schultz Mar. 1985 9 p refs
(Contracts N00014-82-K-0814; DE-AC02-81ER10996)
(AD-A153464; F870002; YALEU/DCS-RR-373) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report discusses the implementation of several classical methods for solving elliptic partial differential equations on the hypercube multiprocessor. The methods considered are the Alternating Directions Implicit (ADI) algorithm, a direct banded Gaussian elimination method and multigrid methods. The complexity analysis of these algorithms shows that high efficiencies can be achieved by carefully assigning the data to the processors and (sometimes) resorting to more parallelizable methods. The binary reflected Gray code plays an important role for both the multigrid and the ADI algorithms. Author (GRA)

N85-29630# Wisconsin Univ., Madison. Mathematics Research Center.
THE ROLE OF ELLIPTICITY AND NORMALITY ASSUMPTIONS IN FORMULATING LIVE-BOUNDARY CONDITIONS IN ELASTICITY Summary Report
P. Podio-Guidugli (Rome Univ.), G. V. Caffarelli (Pisa Univ.), and E. G. Virga (Pisa Univ.) Feb. 1985 16 p
(Contract DAAG29-80-C-0041)
(AD-A153475; MRC-TSR-2788) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that those interactions of an elastic body B with an elastic environment E manifested by local surfacial loadings should be modelled by boundary operators featuring a live system of surfacial forces, i.e., a vector field s, defined over the boundary partial derivative of B and representing the surfacial force per unit area exerted by E over B, which depends functionally in a non-trivial way on the deformation u of B. In addition to the analytical difficulties to be expected, when normality does not hold the mechanical interpretation of boundary conditions fails to be unique. That this is indeed the case is demonstrated by producing an explicit example in linearized elastostatics of a boundary operator condition of traction or as a dead-boundary condition of frictionless contact. GRA

N85-29631# Wisconsin Univ., Madison. Mathematics Research Center.
A QUADRATIC PROGRAMMING ALGORITHM Summary Report
M. J. Best (Waterloo Univ.) and K. Ritter (Techniche Univ., Munich, West Germany) Dec. 1984 33 p Sponsored in part by Natural Sciences and Engineering Research Council of Canada
(Contract DAAG29-80-C-0041)
(AD-A153476; MRC-TSR-2776) Avail: NTIS HC A03/MF A01 CSCL 12/1

By using conjugate directions a method for solving convex quadratic programming problems is developed. The algorithm generates a sequence of feasible solutions and terminates after a finite number of iterations. Extensions of the algorithm for nonconvex and large structured quadratic programming problems is discussed. GRA

N85-29632# Wisconsin Univ., Madison. Mathematics Research Center.
SINGULARITY SOLUTIONS FOR ELLIPSOIDS IN LOW-REYNOLDS-NUMBER FLOWS: WITH APPLICATIONS TO THE CALCULATION OF HYDRODYNAMIC INTERACTIONS IN SUSPENSIONS OF ELLIPSOIDS Summary Report
Sangtae Kim Feb. 1985 44 p Sponsored in part by AMOCO Foundation
(Contract DAAG29-80-C-0041; Grants NSF CPE-84-04451; NSF DMS-82-10950)
(AD-A153503; MRC-TSR-2790) Avail: NTIS HC A03/MF A01 CSCL 12/1

The disturbance velocity fields due to translational and rotational motions of an ellipsoid in a uniform stream, constant vorticity and constant rate-of-strain, required in fundamental studies of behavior of suspensions, have been obtained by the singularity method. These solutions extend earlier solutions for prolate spheroids. Although equivalent solutions were obtained by Oberbeck (1876), Edwardes (1892) and Jeffery (1922) by separation of variable in ellipsoidal coordinates, the singularity solutions are far more simple in form. Other significant results obtained by the singularity method include the exposition of the unified structure shared by the three boundary value problems and the construction of new forms of the Faxen laws for ellipsoids through application of the reciprocal theorem. The disturbance solutions and Faxen laws, the basis for Smoluchowski's (1911) method-of-reflections

technique, are used to calculate hydrodynamic interactions between two or more arbitrarily oriented ellipsoids. In particular, mobility problems are solved directly to order R-5, where R is the centroid-to-centroid separation between the ellipsiods. GRA

N85-29633# Wisconsin Univ., Madison. Mathematics Research Center.
COMPUTABLE NUMERICAL BOUNDS FOR LAGRANGE MULTIPLIERS OF STATIONARY POINTS OF NONCONVEX DIFFERENTIABLE NONLINEAR PROGRAMS Technical Summary Report
O. L. Mangasarian Jan. 1985 8 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-00632)
(AD-A153513; MRC-TSR-2781) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is shown that the satisfaction of a standard constraint qualification of mathematical programming at a stationary point of a nonconvex differentiable nonlinear program provides explicit numerical bounds for the set of all Lagrange multipliers associated with the stationary point. Solution of a single linear program gives a sharper bound together with an achievable bound on the 1-norm of the multipliers associated with the inequality constraints. The simplicity of obtaining these bounds contrasts sharply with the intractable NP-complete problem of computing an achievable upper bound on the p-norm of the multipliers associated with the equality constraints for integer p > or = 1. GRA

N85-29634# Wisconsin Univ., Madison.
A VARIABLE-COMPLEXITY NORM MAXIMIZATION PROBLEM Summary Report
O. L. Mangasarian and T. H. Shiau Jan. 1985 16 p refs
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-00632; NSF DMS-82-10950)
(AD-A153514; MRC-TSR-2780) Avail: NTIS HC A02/MF A01 CSCL 12/1

The solution set to many important constrained optimization problems is a set that is bounded by planes. When such a set is bounded it is useful to find the size of a largest element in that set. In this work we show that this problem may be extremely easy or difficult depending on the measure of size (norm) employed. For one such measure the problem is relatively easy while for all other measures it is intractable. However, the problem of merely finding an upper bound for the size of the largest element turns out to be a surprisingly simple problem that can be solved by a single linear program. GRA

N85-29635# Wisconsin Univ., Madison. Mathematics Research Center.
THE CAUCHY PROBLEM FOR u SUB t = DELTA u(m) WHEN O < M < 1 Technical Summary Report
Miguel A. Herrero (Univ. Complutense) and Michel Pierre (Nancy Univ.) Jan. 1985 28 p Sponsored in part by France-Spain Cooperation Agreement
(Contracts DAAG29-80-C-0041; DAJA37-81-C-0020)
(AD-A153521; MRC/TSR-2784) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper deals with the Cauchy problem for the nonlinear diffusion equation (fast diffusion case). We prove that there exists a global time solution for any locally integrable function u sub o: hence, no growth condition at infinity for u sub o is required. Moreover, the solution is shown to be unique in that class. GRA

N85-29636# Wisconsin Univ., Madison. Mathematics Research Center.
ABOUT PRODUCT FORMULAS WITH VARIABLE STEP-SIZE Technical Summary Report
M. Pierre and M. Rihani Jan. 1985 19 p
(Contract DAAG29-80-C-0041)
(AD-A153527; MRC/TSR-2783) Avail: NTIS HC A02/MF A01 CSCL 12/1

The goal of this paper is to decide whether the Chernoff formula is valid when the step-size is variable. It turns out that under the usual assumptions instability and lack of convergence can appear as soon as the step size is slightly perturbed. We give here an example in that direction. However, we prove that slightly stronger assumptions can prevent these pathological situations. GRA

N85-29637# Wisconsin Univ., Madison.
SENSITIVITY ANALYSIS OF INITIAL VALUE PROBLEMS WITH MIXED ODE'S AND ALGEBRAIC EQUATIONS Technical Summary Report
M. Caracotsios and W. E. Stewart Dec. 1984 34 p
(Contract DAAG29-80-C-0041; Grant NSF CPE-83-08748)
(AD-A153528; MRC/TSR-2777) Avail: NTIS HC A03/MF A01 CSCL 12/1

An efficient method is described for sensitivity analysis of nonlinear initial value problems, which may include algebraic equations as well as ordinary differential equations. The linearity of the sensitivity equations is utilized to solve them directly via the local Jacobian of the state equations. The method is implemented with the implicit integrator DASSL and is demonstrated on a stiff industrial reaction model. GRA

N85-29638# Wisconsin Univ., Madison. Mathematics Research Center.
LEAST-SQUARES APPROXIMATION TO MINIMUM chi-SQUARE ESTIMATORS OF LOCATION AND SCALE PARAMETERS AND THEIR EFFECT ON THE PEARSON chi-SQUARE TEST Technical Summary Report
A. E. Muhly and J. Gurland Feb. 1985 31 p
(Contract DAAG29-80-C-0041)
(AD-A153534; MRC-TSR-2792) Avail: NTIS HC A03/MF A01 CSCL 12/1

Application of the Pearson chi-square test to goodness of fit of a distribution often leads to serious difficulties, particularly in the formation of intervals (as in the case of a continuous distribution) and in the estimation of unknown parameters. Under suitable conditions and with appropriately constructed estimators of the parameters, the test statistic converges in distribution to that of chi-square as the sample size increases. In the present paper, a comparatively simple least-squares approximation to the minimum chi-square estimator is developed which, when appropriately implemented, results in an asymptotic chi-square distribution of the test statistic. This estimator is developed for the cases of fixed and random intervals, and the role of the underlying assumptions is studied in detail. GRA

N85-29639# Wisconsin Univ., Madison. Mathematics Research Center.
INFINITE DIMENSIONAL LINEAR SYSTEMS WITH UNBOUNDED CONTROL AND OBSERVATION: A FUNCTIONAL ANALYTIC APPROACH Technical Summary Report
D. Salamon Feb. 1985 91 p
(Contract DAAG29-80-C-0041; Grant NSF DMS-82-10950)
(AD-A153535; MRC-TSR-2794) Avail: NTIS HC A05/MF A01 CSCL 12/1

The object of these notes is to develop a unifying framework for the functional analytic representation of infinite dimensional linear systems with unbounded input and output operators. On the basis of the general approach new results are derived on the wellposedness of feedback systems and on the linear quadratic control problem. The implications of the theory for large classes of functional and partial differential equations are discussed in detail. GRA

N85-29640# Wisconsin Univ., Madison. Mathematics Research Center.
STUDIES IN QUALITY IMPROVEMENT 2. AN ANALYSIS FOR UNREPLICATED FRACTIONAL FACTORIALS Summary Report
G. E. P. Box and R. D. Meyer Mar. 1985 19 p
(Contract DAAG29-80-C-0041)
(AD-A153539; MRC-TSR-2797) Avail: NTIS HC A02/MF A01 CSCL 12/1

In industrial experimentation it is frequently true that a large proportion of process variation is associated with a small proportion

of the process variables. In such circumstances of effect sparsity unreplicated fractional designs have frequently been effective in isolating preponderant factors. A very useful graphical analysis for such experiments due to Cuthbert Daniel employs normal probability plotting. A more formal analysis is presented here which might be used to supplement such plots. GRA

N85-29641# Wisconsin Univ., Madison. Mathematics Research Center.
ON APPROXIMATING A SET-VALUED FUNCTION LOCALLY Summary Report
V. F. Demyanov, C. Lemarechal, and J. Zowe Jan. 1985 10 p
(Contract DAAG29-80-C-0041)
(AD-A153540; MRC-TSR-2786) Avail: NTIS HC A02/MF A01 CSCL 12/1

Given a multi-valued mapping F, we address the problem of finding another multi-valued mapping H that agrees locally with F in some sense. We show that, contrary to the scalar case, introducing a derivative of F is hardly convenient. For the case when F is convex-compact-valued, we give some possible approximations, and at the same time we show their limitations. The present paper is limited to informal demonstration of concepts and mechanisms. Formal statements and proofs will be published elsewhere. GRA

N85-29642# Wisconsin Univ., Madison. Mathematics Research Center.
LIMIT THEOREMS FOR THE METHOD OF REPLICATION Summary Report
P. W. Glynn Feb. 1985 16 p
(Contracts DAAG29-80-C-0041; ECS-8404809)
(AD-A153541; MRC-TSR-2789) Avail: NTIS HC A02/MF A01 CSCL 12/1

A method of replication is frequently used by simulators to estimate steady-state quantities. In this paper, we obtain conditions under which this method yields asymptotically valid confidence intervals for steady-state means. GRA

N85-29643# Wisconsin Univ., Madison. Mathematics Research Center.
FINDING THE LARGEST L(P)-BALL IN A POLYHEDRAL SET Summary Report
T. H. Shiau Dec. 1984 10 p
(Contract DAAG29-80-C-0041; Grant DMS-8210950)
(AD-A153542; MRC-TSR-2778) Avail: NTIS HC A02/MF A01 CSCL 12/1

A simple linear programming formulation is given for finding a ball or hypercube with largest radius contained in a polyhedral set defined by m linear inequalities. The linear program also has m linear constraints similar to those defining the set. It is shown that finding the largest ball is not much more difficult than finding a feasible point. When the center of ball is fixed, the largest radius is easily obtained as the smallest of m ratios. The results can be extended to balls defined by other norms such as elliptic norms. GRA

N85-29644# Naval Postgraduate School, Monterey, Calif.
AN OPERATIONAL ANALYSIS OF SYSTEM CALIBRATION M.S. Thesis
H. B. Mutlu Sep. 1984 73 p
(AD-A153556) Avail: NTIS HC A04/MF A01 CSCL 05/1

Mathematical models and a computer simulation program written in APL are proposed for studying ways of dealing with mis-calibration. Methodology for assessing the system effectiveness and an approach for optimizing the effectiveness of a calibration program are examined. The application of the theory is discussed and the results of the simulation program are presented. Author (GRA)

N85-29645# Naval Postgraduate School, Monterey, Calif.
A COMPARISON OF METHODS OF LEAST SQUARES ADJUSTMENT OF TRAVERSES M.S. Thesis
S. Aumchantr Dec. 1984 152 p
(AD-A153612) Avail: NTIS HC A08/MF A01 CSCL 12/1

Traverse is a method of surveying in which a sequence of lengths and directions of lines between points on the Earth are measured and used in determining positions of the points. This method is one of several used to find the accurate geodetic positions which various agencies use. Traversing is a convenient, rapid method for establishing horizontal control. The theoretical background is provided here to explain the method of traverse station position computations and adjustments in the Universal Transverse Mercator grid coordinates. Closed traverse station positions were computer adjusted using the Approximate Method and by the Least Squares Method computer program. The adjusted coordinates of both methods were transformed from the Universal Transverse Mercator grid coordinates to geographic coordinates and compared with the coordinates which were adjusted by the U.S. National Ocean Service. Author (GRA)

N85-29646# Decision Science Consortium, Inc., Falls Church, Va.
ALTERNATIVE THEORIES OF INFERENCE IN EXPERT SYSTEMS FOR IMAGE ANALYSIS Final Report, 15 Jun. 1984 - 14 Jan. 1985
M. S. Cohen, S. R. Watson, and E. Barrett Feb. 1985 167 p
(Contract DACA72-84-C-0005)
(AD-A153649; DSCI-85-1; ETL-0382) Avail: NTIS HC A08/MF A01 CSCL 12/1

Reasoning with uncertainty is essential in most expert system applications to image understanding, both for bottom-up analysis of pixel data and for top-down utilization of general knowledge. A variety of alternative approaches have been proposed for inherence in expert systems: Bayesian probabilities, belief functions, fuzzy sets, non-monotonic logic, and others. They differ in the concepts they seek to address, in their normative justification, in computational feasibility and input burden, and psychological aptness for the purposes of experts and expert system users. The present report has two main objectives: (1) to clarify the strengths and weaknesses of various inference mechanisms for expert system applications, and (2) to develop alternative approaches which remedy shortcomings and retain strengths. We develop the top-level design of a new system, the Non-Monotonic Probabilist (NMP), which takes into account the actual practice of expert statisticians in probabilistic reasoning. GRA

N85-29647# Naval Surface Weapons Center, Dahlgren, Va. Strategic Systems Dept.
TENTH-ORDER EXPANSION FORMULAE FOR THE ORBITAL ECCENTRICITY FUNCTION K (SUB Ipq)(e) OBTAINED USING A SYMBOLIC ALGEBRAIC MANIPULATION SYSTEM Final Report
S. C. Matney and A. D. Parks Nov. 1984 30 p refs
(AD-A153754; NSWC/TR-84-355) Avail: NTIS HC A03/MF A01 CSCL 12/1

The development of symbolic algebraic manipulation systems for use on digital computers is a fairly recent technical innovation that has not even begun to be fully exploited. The potential for application of these systems to the nonnumeric resolution of complex problems seems boundless. The purpose of this report is to provide the results obtained from the utilization of one such state of the art system, MACSYMA, to provide high-order expansion formulae for the classical orbital eccentricity function found in celestial mechanics theory. These formulae are generally applicable to low eccentricity orbits, and the relative ease with which they were generated demonstrates MACSYMA's analytical process. GRA

N85-29648# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
LIMIT BEHAVIOUR FOR STOCHASTIC MONOTONICITY AND APPLICATIONS
H. Cohn Feb. 1985 49 p
(Contract F49620-82-C-0009)
(AD-A153814; Tr-93; AFOSR-85-0402TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A transition probability function P is said to be stochastically monotone if P(x,-ALPHA,Y) is non-increasing in x for every fixed y. A (non-homogeneous) Markov chain or process is said to be stochastically monotone if its transition probability functions are stochastically monotone. Diffusions, random walks, birth-and-death and branching processes are examples of such models. It is shown that stochastically monotone processes exhibit two basic types of asymptotic behavior. Chains with stationary transiton probabilities display a cyclic pattern, and a suitably normed and centered chain turns out to converge almost surely if it is geometrically growing. Applications to diffusions and branching processes are added. GRA

N85-29649# Iowa Univ., Iowa City.
BAYESIAN FULL RANK MARGINALIZATION FOR 2-WAY CONTINGENCY TABLES Technical Report, 1 Jul. 1983 - 5 Apr. 1985
Tom Leonard and Melvin R. Novick 5 Apr. 1985 59 p refs
(Contract N00014-83-C-0514)
(AD-A153841; TR-85-4-ONR) Avail: NTIS HC A04/MF A01 CSCL 12/1

A general approach is proposed for modeling the structure of a two-way contingency table, and for drawing inferences about the marginal and interaction effects, cell parameters, and conditional probabilities. The prior distribution expresses uncertainty in a simple reduced model, in particular the independence model. The posterior estimates of the cell parameters then provide compromises between the cell frequencies and fitted values obtained under the reduced model. In a mental test context, the reduced independece model is identical to Rasch's multiplicative Poisson model, and we therefore incorporate a procedure for checking the adequacy of this model. Using some general ideas on marginalization, it is possible to compute reasonable approximations to the full posterior densities of many parameters of interest thus permitting thorough parametric inference and statistical modeling. It is possible to proceed with the full interaction model even in the presence of zero cell frequencies. All prior parameters are evaluated with the assistance of the data via a hierarchical Bayes procedure, thus permitting the sensible analysis of data sets. An r x s cross classification of 5648 Marine Corps clerical students by school and test grade is analyzed in detail and the posterior densities of the 96 possible interactions are used to suggest a simplified structure partitioning and collapsing the table into a meaningful 3 x 2 table. GRA

N85-29650# Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
HIGH PERFORMANCE ASYNCHRONOUS LIMITED SENSING ALGORITHMS FOR CSMA AND CSMA-CD CHANNELS
M. Georgiopoulos, L. Merakos, and P. Papantoni-Kazakos Mar. 1985 44 p refs
(Grant AF-AFOSR-0229-83; AF Proj. 2304)
(AD-A153919; UCT/DEECS/TR-85-2; AFOSR-85-0398TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

We consider the random multiple access of a collision-type, packet-switched channel, for the Poisson user model in a local area network environment, where carrier sensing techniques are possible due to small propagation delays. We propose and analyze asynchronous (unslotted) random access algorithms that belong to a recently emerged class of random-access algorithms, called limited channel sensing algorithms. Utilizing the regenerative character of the stochastic processes that are associated with the random access system, we derive lower bounds on the maximum stable throughput, and tight upper and lower bounds on the induced mean packet delay. The proposed algorithms are inherently stable, they combine good performance with modest channel sensing requirements, and they outperform their synchronous counterparts in some Ethernet and mobile radio environments. GRA

N85-29651# Chicago Univ., Ill. Center for Decision Research.
ACCEPTING ERROR TO MAKE LESS ERROR
Hillel J. Einhorn Apr. 1985 26 p refs
(Contract N00014-84-C-0018; NR Proj. 197-080)
(AD-A153949; TR-14) Avail: NTIS HC A03/MF A01 CSCL 12/1

It is argued that the clinical and statistical approaches rest on different assumptions about the nature of random error and the appropriate level of accuracy to be expected in prediction. To examine this, a case is made for each approach. The clinical approach is characterized as being deterministic, causal, and less concerned with prediction than with diagnosis and treatment. The statistical approach accepts error as inevitable and in so doing, makes less error in prediction. This is illustrated using examples from probability learning and equal weighting in linear models. Thereafter, a decision analysis of the two approaches is proposed. Of particular importance are the errors that characterize approach; myths, magic, and illusions of control in the clinical; lost opportunities and illusions of the lack of control in the statistical. It is concluded that each approach represents a gamble with corresponding risks and benefits. GRA

N85-29652# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
PERFORMANCE EVALUATION OF STOCHASTIC TIMED DECISION-FREE PETRI NETS
R. Paul Wiley and Robert R. Tenny Mar. 1985 41 p refs
(Contracts N00014-77-C-0532; N00014-84-K-0519)
(AD-A153987; LIDS-P-1443) Avail: NTIS HC A03/MF A01 CSCL 12/1

The advent of low-cost processors has made the construction of highly complex, decentralized systems feasible. These systems are usually divided into interacting components which operate concurrency and coordinate their operations by using an asynchronous protocol. Petri Nets have frequently been used to model such systems as they can model concurrency and asynchronous protocols. This paper shows how the performance of a simple subclass of STNPs, that of Stochastic Timed Decision-Free Petri Nets (STDFPNs), can be predicted. This subclass can model concurrency and coordination, but not decisions, and have been used to model certain manufacturing systems. The major contribution is a new analysis technique which uses a set of equations that describe the behavior of that system. The resulting algorithms are computationally more attractive and the general approach can be extended to study less restrictive classes of SRPNs. GRA

N85-29653# Argonne National Lab., Ill.
PIPELINED GIVENS METHOD FOR COMPUTING THE QR FACTORIZATION OF A SPARSE MATRIX
M. T. Heath and D. C. Sorensen Feb. 1985 19 p refs
(Contract W-31-109-eng-38)
(DE85-009772; ANL/MCS-TM-47) Avail: NTIS HC A02/MF A01

An extension of the Pipelined Givens method for computing the OR factorization of a real m x n matrix to the case in which the matrix is sparsed, is discussed. When restricted to one procss, the algorithm performs the same computation as the serial sparse Givens algorithm of George and Heath. The implementation is compatible with the data structures used in SPARSPAK. The pipelined algorithm is well suited to parallel computers with a globally shared memory and low overhead synchronization primitives, such as the Denelcor HEP, for which computational results are presented. Certain synchronization problems that arise in the adaptation to the sparse setting are pointed out and the effect on parallel speedup of accessing a serial data file is discussed. DOE

N85-29654# Texas Univ., Austin. Inst. of Fusion Studies.
COVARIANT POISSON BRACKETS FOR CLASSICAL FIELDS
J. E. Marsden (California Univ., Berkeley), R. Montgomery (California Univ., Berkeley), P. J. Morrison, and W. B. Thompson (California Univ., San Diego, La Jolla) Jan. 1985 26 p refs
(Contract DE-FG05-80ET-53088)
(DE85-010085; DOE/ET-53088/168; IFSR-168; UC-PAM-259) Avail: NTIS HC A03/MF A01

Poisson brackets that are covariant under spacetime coordinate

changes are presented for relativistic field theories. The formalism described here is an alternative to the sympletic formulation of field theories and has several advantages. It applies to relativistic fluids and plasmas written in Eulerian variables, while the symplectic formulation does not. It is expected to simplify and clarify the transition to the dynamic (or 3+1) Hamiltonian formalism as well. DOE

N85-29655# Argonne National Lab., Ill. Mathematics and Computer Science Div.
EXTRAPOLATION METHODS FOR MULTI-DIMENSIONAL QUADRATURE OF SINGULAR AND REGULAR INTEGRAND FUNCTIONS
J. N. Lyness Feb. 1985 23 p refs
(Contract W-31-109-eng-38)
(DE85-009665; ANL/MCS-TM-45) Avail: NTIS HC A02/MF A01

The existence of various expansions on which extrapolation may be based is reviewed. Relatively few expansions in quadrature are known. These are usually simple to state and simple to use, but some require long involved proofs (which are not given here). A simple way to use them is discussed. How the elementary theory of numerical quadrature can be used on the Euler Maclaurin summation formula is also discussed. If this is done, extrapolation in quadrature is seen as a natural integrated branch of numerical quadrature and not as an apparently independent theory. The development of an extrapolation technique is conveniently considered in three phases. The first phase involves choosing a suitable expansion on which to base the extrapolation. The second consists of deciding on a quadrature rule and a mesh ratio sequence. A third phase involves choosing an efficient algorithms for the extrapolation calculation. DOE

N85-29656# California Univ., Livermore. Lawrence Livermore Lab.
TRANSFORM DOMAIN ADAPTIVE FILTERING USING A RECURSIVE DFT
G. A. Clark, M. A. Soderstrand (California Univ., Davis), and T. G. Johnson (California Univ., Davis) Mar. 1985 6 p refs Presented at the Intern. Symp. on Circuits and Systems, Kyoto, 5-7 Jun. 1985
(Contract W-7405-eng-48)
(DE85-008965; UCRL-92312; CONF-8506105-1) Avail: NTIS HC A02/MF A01

This paper discusses the use of a recursive DFT (discrete Fourier transform) with frequency-domain adaptive filters. It is shown that, even though the recursive DFT ordinarily has stability problems when implemented in finite precision arithmetic, it is stable when used with an appropriate numerical roundoff procedure, making it practical for use with frequency-sampling type adaptive filters. DOE

N85-29657# California Univ., Livermore. Lawrence Livermore Lab. Mathematics and Statistics Div.
MONOTONICITY PRESERVING BICUBIC INTERPOLATION Progress Report
F. M. Fritsch and R. E. Carlson Nov. 1984 10 p refs Presented at the 2nd Intern. Symp. on Surfaces in Computer Aided Geometric Design, Oberwolfach, West Germany, 11-17 Nov. 1984
(Contract W-7405-eng-48)
(DE85-004206; UCRL-91788; CONF-8411129-1) Avail: NTIS HC A02/MF A01

A new algorithm for piecewise bicubic interpolation to bivariate data on a rectangular mesh is described. The Hermite for is used to represent the resulting surface. The Hermite derivatives are determined by a five step procedure that guarantees a monotonic interpolant to monotonic data. DOE

N85-29658# Rome Univ. (Italy). Dipt. di Fisica.
APPROXIMATE INVERSE SPECTRAL TRANSFORM FOR THE KORTEWEG-DE VRIES EQUATION
D. Levi and O. Ragnisco 16 Jul. 1984 6 p refs Sponsored by Italian Ministry of Public Education
(PREPRINT-411) Avail: NTIS HC A02/MF A01

A formalism which allows to derive in closed form the solution of the Cauchy problem for the Korteweg - de Vries equation for short times is proposed. The solution is obtained by going over to a Pade approximant of the time evolved reflection coefficient. Author (ESA)

N85-29659# Rome Univ. (Italy). Dipt. di Fisica.
A NUMERICAL INVESTIGATION OF THE OVERLAP DISTRIBUTION AMONG PURE STATES IN THE SPIN GLASS PHASE
N. Parga (Centro Atomico Bariloche, Argentina), G. Parisi, and M. A. Virasoro 3 Sep. 1984 15 p refs
(PREPRINT-414) Avail: NTIS HC A02/MF A01

Zero temperature mean field equations are used to study numerical properties of the Sherrington Kirkpatrick model for the spin glass phase. Fluctuations from sample to sample of the order parameter are observed. Partial evidence of the ultrametricity structure among pure states is seen. Author (ESA)

N85-29660# Rome Univ. (Italy). Dipt. di Fisica.
DETERMINAL REPRESENTATIONS OF POLYNOMIALS SATISFYING LINEAR ORDINARY DIFFERENTIAL EQUATIONS (ODES) OR LINEAR RECURRENCE RELATIONS
F. Calogero 26 Sep. 1984 4 p refs Presented at Intern. Symp. on Orthogonal Polynomials and their Appl., Bar-le-Duc, France, 15-18 Oct. 1984
(PREPRINT-417) Avail: NTIS HC A02/MF A01

It is shown that any polynomial Pn(x) satisfying a linear ordinary differential equation can be represented as the determinant of an explicit nxn matrix linear in the variable x and containing n arbitrary parameters. Analogous representations exist for polynomials satisfying linear recursion relations. Author (ESA)

N85-29661# Rome Univ. (Italy). Dipt. di Fisica.
SOME APPLICATIONS OF A CONVENIENT FINITE-DIMENSIONAL MATRIX REPRESENTATION OF THE DIFFERENTIAL OPERATOR
F. Calogero 26 Sep. 1984 25 p refs Presented at Intern. Conf. on Special Functions, Turin, 10-12 Oct. 1984
(PREPRINT-418) Avail: NTIS HC A02/MF A01

Representations of the (multiplicative) operator X and the corresponding linear differential operator (D O), d/dx projected into polynomials space with one variable, are considered. It is proved that all polynomial solutions of linear D O of finite order generate one polynomial solution into representation. Polynomial interpolation of functions and spectral analysis of D O are related to those representations. Author (ESA)

N85-29662# Rome Univ. (Italy). Dipt. di Fisica.
INTERPOLATION AND DIFFERENTIATION FOR PERIODIC FUNCTIONS
F. Calogero 16 Oct. 1984 4 p refs Submitted for publication
(PREPRINT-419) Avail: NTIS HC A02/MF A01

Representation of the (multiplicative) operator X and the corresponding differential operator (D O), d/dx projected into spaces of periodic (or antiperiodic) functions of one variable or arbitrary period, are considered. It is proved that all periodic (or antiperiodic of degree even) solutions of degree odd of D O of finite order give one periodic (or antiperiodic) solution of linear D O of the representation. Polynomial interpolation of a function whose values are pre-assigned and a method to compute the eigenvalves of D O are related to this representation. Author (ESA)

N85-29663# Rome Univ. (Italy). Dipt. di Fisica.
SPECTRAL TRANSFORM APPROACH TO BACKLUND TRANSFORMATIONS
A. Degasperis 17 Oct. 1984 15 p refs
(PREPRINT-420) Avail: NTIS HC A02/MF A01

A method for spectral transformation applied to Backlund transforms used to construct solutions of nonlinear evolution equations is outlined. Three nonlinear partial differential equations are solved by the Backlund transform. Properties of solutions are discussed. Author (ESA)

N85-29664# Rome Univ. (Italy). Dipt. di Fisica.
AN INTRODUCTORY VIEW OF RAMAN-NATH TYPE EQUATIONS
G. Dattoli, R. Mignani, and A. Torre (Istituto di Fisica Teorica-Mostra d'Oltremare, Naples, Italy) 29 Oct. 1984 38 p refs Presented at 2nd Workshop on Hadronic Mech., Como, Italy, Aug. 1984
(PREPRINT-422) Avail: NTIS HC A03/MF A01

The properties and applications of the Raman-Nath (RN) recursive differential equations are introduced. Shift, harmonic and spherical (or SU(2)) RN equations are exactly solved by operatorial techniques based on the Magnus expansion and the Wei-Norman theorem. The SU(n) RN equations are discussed. Perturbative solutions of special cases of shift and harmonic RN equations are considered. The application of RN equations to the solution of Schroedinger-like partial differential equations is outlined. Author (ESA)

N85-29665# Rome Univ. (Italy). Dipt. di Fisica.
THE HAMILTONIAN STRUCTURE OF A COMPLEX VERSION OF THE BURGERS HIERARCHY
M. Bruschi and O. Ragnisco 12 Nov. 1984 12 p refs Sponsored by Italian Ministry of Public Education
(PREPRINT-423) Avail: NTIS HC A02/MF A01

A class of integrable Hamiltonian nonlinear evolution equations generated by a purely differential recursion operator is constructed. This hierarchy is a complex version of the Burgers hierarchy and can be linearized through a generalization of the Cole-Hopf transformation. Author (ESA)

N85-29666# Rome Univ. (Italy). Dipt. di Fisica.
REDUCTION TECHNIQUES FOR INFINITE-DIMENSIONAL HAMILTONIAN SYSTEMS: SOME IDEAS AND APPLICATIONS
F. Magri (Milan Univ.), C. Morosi (Politecnico di Milano), and O. Ragnisco 12 Nov. 1984 53 p refs Sponsored by Italian Ministry of Public Education
(PREPRINT-424) Avail: NTIS HC A04/MF A01

Integrability properties of infinite-dimensional Hamiltonian system expressed as nonlinear evolution equations (NEE) are considered. Integrability structures are described by geometric (Poisson-Nijenhius manifolds) methods. Different hierarchies of NEE are discussed. Author (ESA)

N85-29667# Rome Univ. (Italy). Dipt. di Fisica.
NUMERICAL TESTS OF A NOVEL TECHNIQUE TO COMPUTE THE EIGENVALUES OF DIFFERENTIAL OPERATORS
F. Calogero and E. Franco 11 Jan. 1985 46 p refs
(PREPRINT-427) Avail: NTIS HC A03/MF A01

A method to compute the eigenvalues of differential operators based on a finite dimensional matrix representation is tested numerically. Applications are given. Author (ESA)

N85-29668# Rome Univ. (Italy). Dipt. di Fisica.
FURTHER RESULTS ON THE EQUIPARTITION THRESHOLD IN LARGE NONLINEAR HAMILTONIAN SYSTEMS
Roberto Livi (Florence Univ.), Marco Pettini (Osservatorio Astrofisica di Arcetri), Stefano Ruffo (Florence Univ.), and Angelo Vulpiani 11 Jan. 1985 9 p refs Submitted for publication Sponsored by Fondazione Angelo delle Riccia
(PREPRINT-428) Avail: NTIS HC A02/MF A01

Numerical results of the Fermi-Pasta-Ulm (FPU) Alpha-model described by a Hamiltonian system with periodic boundary conditions are studied. Ergodicity threshold in the FPU alpha-model is shown. This feature is common to several nonlinear Hamiltonian systems. Author (ESA)

N85-29669# Rome Univ. (Italy). Dipt. di Fisica.
CHARACTERIZATION OF INTERMITTENCY IN CHAOTIC SYSTEMS
Roberto Benzi (IBM, Rome), Giovanni Paladin, Giorgio Parisi, and Angelo Vulpiani 14 Jan. 1985 28 p refs
(PREPRINT-429) Avail: NTIS HC A03/MF A01

The characterization of intermittency in chaotic dynamical systems is studied by the time fluctuations of the response to a slight trajectory perturbation. A set of exponents which generalize the maximum Lyapunov characteristic exponent is introduced. The link with the statistical mechanics formalism is emphasized and it is shown that the exponents are connected to a free energy formally defined for chaotic systems. Analytical computations are performed for simple cases and numerical examples are shown. Author (ESA)

N85-29670# Rome Univ. (Italy). Dipt. di Fisica.
ON THE TRANSFORMATION OF DERIVATIVES OF DISTRIBUTIONS ON SURFACES
K. A. Rustamov (Academy of Sciences of the Azerbaijan SSR, Baku, USSR) and B. A. Rajabov (Academy of Sciences of the Azerbaijan SSR, Baku, USSR) 30 Jan. 1985 8 p refs Sponsored by CNR and USSR Academy of Sciences
(PREPRINT-434) Avail: NTIS HC A02/MF A01

The problem on the transformation of the generalized functions concentrated on smooth surfaces and their derivatives is solved for infinite Lie group C sup inf (R sup n, GL (n)). Author (ESA)

N85-29671# Rome Univ. (Italy). Dipt. di Fisica.
TO THE THEORY OF APPROXIMATION OF EXPERIMENTAL CURVES BY SMOOTH FUNCTIONS
A. M. Baghirov (Academy of Sciences of the Azerbaijan SSR, Baku, USSR), K. A. Rustamov (Academy of Sciences of the Azerbaijan SSR, Baku, USSR), and M. K. Sulejmanov (Academy of Sciences of the Azerbaijan SSR, Baku, USSR) 1 Feb. 1985 10 p refs Sponsored by CNR and USSR Academy of Sciences
(PREPRINT-438) Avail: NTIS HC A02/MF A01

Properties of Chebyshev functions are studied using discrete gradients. Two relaxation methods of unsmooth optimization are developed. Rates of convergence of these methods are estimated. Author (ESA)

N85-29871*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ON THE NUMERICAL COMPUTATION OF NONLINEAR FORCE-FREE MAGNETIC FIELDS
S. T. Wu (Alabama Univ., Huntsville), H. M. Chang (Alabama Univ., Huntsville), and Mona J. Hagyard *In its* Meas. of Solar Vector Magnetic Fields May 1985 p 17-48 refs (For primary document see N85-29869 18-92)
(Contract NAS8-33525; Grant NAGw-9; Contract F19628-83-K-0019)
Avail: NTIS HC A21/MF A01 CSCL 12A

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N85-29672# Wisconsin Univ., Madison. Mathematics Research Center.
NONPARAMETRIC RENEWAL FUNCTION ESTIMATION Summary Report
Edward W. Frees Jan. 1985 28 p refs
(Contract DAAG29-80-C-0041)
(AD-A153474; MRC-TSR-2785) Avail: NTIS HC A03/MF A01 CSCL 12/1

The renewal function is a basic tool used in many probabilistic models and sequential analysis. Based on a random sample of size n, a nonparametric estimator of the renewal function is introduced. Asymptotic properties of the estimator such as the almost sure consistency and local asymptotic normality are developed. A discussion of an asymptotic normality are developed. A discussion of an application of the estimator is also provided. GRA

N85-29673# Wisconsin Univ., Madison. Mathematics Research Center.
EFFECT OF SOME ESTIMATORS ON A LARGE SAMPLE APPROXIMATION TO THE NON-NULL DISTRIBUTION OF THE

PEARSON CHI-SQUARE STATISTIC Summary Report
Alan E. Muhly and John Gurland Feb. 1985 42 p refs
(Contract DAAG29-80-C-0041)
(AD-A153515; MRC-TSR-2793) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper three distinct formulations of the Pearson chi-square test statistic, each of which employs random interval boundaries, are considered in presenting an answer to the following problem: Given a finite sample size and specified fixed composite null and alternative hypotheses, which method of estimation of the unknown parameters leads to a test which is most sensitive to departures from the null hypothesis in the direction of the fixed alternative? The proposed answer is based on a finite sample size approximation to the distribution of the appropriate quadratic form under the alternative hypothesis. GRA

N85-29674# Wisconsin Univ., Madison.
NONPARAMETRIC ESTIMATION OF THE PROBABILITY OF RUIN Summary Report
Edward W. Frees Feb. 1985 20 p refs
(Contract DAAG29-80-C-0041)
(AD-A153523; MRC/TSR-2795) Avail: NTIS HC A02/MF A01 CSCL 12/1

The finite and infinite horizon time probability of ruin are important parameters in the study of acturial risk theory. This paper introduces procedures for directly estimating these key parameters from a random sample of observations without assumptions as to the parametric form of the distribution from which the observations arise. The estimators introduced apply to most of the classical models in which ruin probabilities are used and also apply to a much broader class of models. The procedures are based on the concept of sample reuse, and old idea in statistics which is becoming more popular due to the widespread availability of high speed computers. In this paper, the almost sure consistency of the estimators is established, Further, finite sample properties of the estimators are investigated in a simulation study. GRA

N85-29675# Stanford Univ., Calif. Dept. of Statistics.
FIXED WIDTH INTERVAL ESTIMATION IN LINEAR REGRESSION
A. Y. C. Kuk 7 Mar. 1985 13 p
(Contract N00014-76-C-0475)
(AD-A153633; TR-354) Avail: NTIS HC A02/MF A01 CSCL 12/1

We discuss fixed-width interval estimation for the slope parameter in a simple linear regression when the X sub i are also normally distributed. A two-stage procedure that combines prediction with estimation is described. In addition, we discuss two sequential procedures. The confidence intervals obtained are used to construct tests with level and power at least independent of the values of the other parameters. We also consider a sequential procedure based on the distribution of the sample correlation coefficient; the resulting test attains the specified level and power asymptotically. GRA

N85-29676# Massachusetts Inst. of Tech., Cambridge. Statistics Center.
A ROBUST ESTIMATOR OF LOCATION USING AN ADAPTIVE SPLINE MODEL
D. Y. Kim Mar. 1985 94 p
(Contract N00014-75-C-0555)
(AD-A153662; AD-E401312; TR-37-ONR) Avail: NTIS HC A05/MF A01 CSCL 12/1

This paper contains a new approach toward the robust estimation of a location parameter. We propose NPS (Normal Pareto Spline) distribution which provides rough fit to density functions for arbitrary unimodal symmetric distributions. The bases of our NPS estimation are Pareto tails and spline constraints. Pareto tails can represent a diversity of tail behavior, and spline constraints ensure the smoothness of the density function. We show that the NPS estimate of location has lower asymptotic variance than Huber's M-estimator in most cases, regardless of how Huber's trimmed constant k is chosen. We also show that the NPS estimate of location can guarantee resistance for outliers. For the generalized two sample location problem, where the scale parameters are unequal, we propose an iterative method to estimate the shift parameter and also have a proof that this iterative method converges to the desired M-estimate for an arbitrary scale location family of symmetric distributions. GRA

N85-29677# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
DETECTION OF MULTIVARIATE OUTLIERS WITH DISPERSION SLIPPAGE IN ELLIPTICALLY SYMMETRIC DISTRIBUTIONS
R. Das and B. K. Sinha Mar. 1985 15 p
(Contract F49620-85-C-0008)
(AD-A153785; TR-85-04; AFOSR-85-0366TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

An extension of Ferguson's univariate normal results for detection of outliers with variance slippage is made to the multivariate elliptically symmetric case with dispersion slippage. The locally optimum test statistic derived possesses all three robustness properties: optimality, null and nonnull. As a technical tool, Wijsman's representation theorem is used. Author (GRA)

N85-29678# Pittsburgh Univ., Pa. Center for Multivariate Analysis.
ON THE CHARACTERIZATION OF NONNEGATIVELY ESTIMABLE LINEAR COMBINATIONS OF VARIANCE COMPONENTS
T. Mathew Mar. 1985 17 p
(Contract F49620-85-C-0008)
(AD-A153786; TR-85-06; AFOSR-85-0353TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document shows that, by a reparameterization, the problem of estimating a linear combination of variance components can be reduced to that of estimating single variance component. Such a reduction is used to obtain some characterizations of nonnegatively estimable linear combinations of various components. Characterization of nonnegative estimability using MINQUE is also discussed. GRA

N85-29679# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
EXTENT TO WHICH LEAST-SQUARES CROSS-VALIDATION MINIMIZES INTEGRATED SQUARE ERROR IN NONPARAMETRIC DENSITY ESTIMATION
P. Hall and J. S. Marron Feb. 1985 27 p
(Contract F49620-82-C-0009)
(AD-A153789; TR-94; AFOSR-85-0401TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Let h sub 0, h (hat) sub 0 and h (hat) sub c be the windows which minimize mean integrated square error, integrated square error and the least square cross validatory criterion, respectively, for kernel density estimates. It is argued that h (hat) sub 0, not h sub 0, should be the benchmark for comparing different data driven approaches to the determination of window size. Asymptotic properties of h sub 0 - h (hat) sub 0 and of differences between integrated square errors evaluated at these windows, are derived. It is shown that in comparison to the benchmark h (hat) sub 0, the observable window h (hat) sub c performs as well as the so called optimal but unattainable window h sub 0, to both first and second order. Author

N85-29680# Washington Univ., Seattle. Lab. for Chemometrics.
CHEMOMETRIC ANALYSIS OF MULTISENSOR ARRAYS Interim Report
W. P. Carey, K. R. Beebe, E. Sanchez, P. Geladi, and B. R. Kowalski 15 Apr. 1985 22 p
(Contract N00014-75-C-0536)
(AD-A153805; TR-33) Avail: NTIS HC A02/MF A01 CSCL 12/1

A discussion of multivariate calibration techniques and their possible application to sensor array data is reviewed. The progression from multiple linear regression, and principal compo-

nents regression, to partial least squares can be described by the analysis of their respective algorithms and the data analysis of their respective algorithms and the data analysis problems each of them solve. Additional analysis models are introduced to detect underlying background problems for sensor arrays and the ability to quantitate analysis directly by rank annihilation factor analysis when two dimensional data is obtained. GRA

N85-29681# Iowa Univ., Iowa City.
BAYESIAN INFERENCE AND DIAGNOSTICS FOR THE 3 PARAMETER LOGISTIC MODEL Technical Report, 1 Jul. 1983 - 8 Apr. 1984
Tom Leonard and Melvin R. Novick 8 Apr. 1985 29 p refs
(Contract N00014-83-C-0514)
(AD-A153840; TR-85-5-ONR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Allan Birnbaum made two historical contributions to the theories of statistics and educational testing. The first was his famous 1962 proof that the sufficiency and conditionality principles together imply the likelihood principle, thus justifying conditional, e.g., Bayesian, inference when compared with frequentist inference. The second was his famous mental test model introduced in Lord and Novick (1968). This proposal attempts to follow in Birnbaum's tradition by using Bayesian ideas to show that his mental test model possesses even broader applicability than hitherto realized. A conditional maximization procedure is used to approximate numerical integrations thus broadening the scope of Bayesian inference and model checking. GRA

N85-29682# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Dept.
EVALUATION OF DENSITIES AND DISTRIBUTIONS VIA HERMITE AND GENERALIZED LAGUERRE SERIES EMPLOYING HIGH-ORDER EXPANSION COEFFICIENTS DETERMINED RECURSIVELY VIA MOMENTS OR CUMULANTS
Albert H. Nuttall 28 Feb. 1985 139 p
(NUSC Proj. A75205; ZR0000101)
(AD-A153950; NUSC-TR-7377) Avail: NTIS HC A07/MF A01 CSCL 12/1

In the theoretical analysis of performance of some systems with nonlinearities and/or memory, it often happens that the only statistics about the decision (or output) random variable of interest that can be easily found are the moments, or in other cases, the cumulants. Explicit relations for the low-order expansion coefficients in Edgeworth of Gram-Charlier series are available in terms of the available moments or cumulants. However, for higher-order moments and cumulants, these explicit nonrecursive relations are very tedious to derive, become extremely lengthy, and are not practical to use. This document addresses the problem of obtaining accurate high-order series expansion approximations of the probability density function and cumulative distribution function of a random variable of interest, in terms of the available moments or cumulants of that random available. The necessity of being available to approximate probability density functions and cumulative distribution functions from knowledge of either moments ofr the cumulants, is that some physical problems have these particular statistics as natural and convenient starting points. GRA

N85-29683# Rome Univ. (Italy). Dipt. di Fisica.
FAST ELECTROMAGNETIC (EM) SHOWER SIMULATION
E. Longo and L. Luminari 4 Oct. 1984 22 p refs
(NOTA-INTERNA-831) Avail: NTIS HC A02/MF A01

A Monte Carlo method for simulation of electromagnetic showers is outlined. A full simulation is performed following all the particles above a relatively high energy cut-off, and then replacing the particles below the cut-off by pregenerated (frozen) showers, representd by the energy deposition in cells of suitable size. Fluctuations and correlations are reproduced by the initial simulation (then reducing the size of samples to keep stored), while the use of low energy frozen showers provides a tridimensional shape much more realistic than any parametrization. Results for showers in BGO crystals in the energy range 1 to 10 GeV indicate an accuracy comparable with usual simulations with a simulation time reduced by more than an order of magnitude. Author (ESA)

N85-29684# Rome Univ. (Italy). Dipt. di Fisica.
NUMERICAL SIMULATION OF THE TRANSIENT BY THE UNSTABLE STATE IN A LOTKA-VOLTERRA MODEL
V. Bouche 16 Oct. 1984 32 p refs
(NOTA-INTERNA-833) Avail: NTIS HC A03/MF A01

A stochastic theory for the Lotka-Volterra model in the large volume limit, in presence of immigration rates, is proposed. Numerical calculations for the transient from an unstable equilibrium state of the system (zero population) are made when noise is considered. The joint effect of immigration and fluctuations on the deterministic motion was studied. The joint effect of the two terms results in a swift growing by the time of the constant of motion until it reaches a value oscillating randomly around the equilibrium state value. A theory for easy limits is sketched. Author (ESA)

N85-29685# Rome Univ. (Italy). Dipt. di Fisica.
STOCHASTIC RESONANCE IN THE LANDAU-GINZBURG EQUATION
Roberto Benzi (IBM, Rome, Italy), Alfonso Sutera, and Angelo Vulpiani 14 Jan. 1985 24 p refs
(PREPRINT-430) Avail: NTIS HC A02/MF A01

The mechanism of stochastic resonance in the case of the Landau-Ginzburg equation stochastically and periodically perturbed is studied using stochastic partial differential equations. Analytical expressions to compute the exit times of the system and to estimate the range of the noise for which the stochastic resonance is possible are given. Author (ESA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N85-29686*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXTRACTION OF AERODYNAMIC PARAMETERS FOR AIRCRAFT AT EXTREME FLIGHT CONDITIONS
Kenneth W. Iliff May 1985 24 p refs Presented at the AGARD Symp. on Unsteady Aerodyn. Fundamentals and Appl. to Aircraft Dyn., Goettingen, West Germany, 6-9 May 1985
(NASA-TM-86730; H-1290; NAS 1.15:86730; AGARD-Paper-24) Avail: NTIS HC A02/MF A01 CSCL 12B

The maximum likelihood estimator has been used to extract stability and control derivatives from flight data for many years. Most of the literature on aircraft estimation concentrates on new developments and applications, assuming familiarity with basic concepts. This paper briefly discusses the maximum likelihood estimator and the aircraft equations of motion that the estimator uses. The current strength and limitations associated with obtaining flight-determined aerodynamic coefficients in extreme flight conditions is assessed. The importance of the careful combining of wind tunnel results (or calculations) and flight results and the thorough evaluation of the mathematical model is emphasized. The basic concepts of minimization and estimation are examined for a simple computed aircraft example, and the cost functions that are to be minimized during estimation are defined and discussed. Graphic representations of the cost functions are given to help illustrate the minimization process. Finally, the basic concepts are generalized, and estimation of stability and control derivatives from flight data is discussed. Author

N85-29687*# Technion Research and Development Foundation Ltd., Haifa (Israel). Dept. of Aeronautical Engineering.
AN EXTENDED TWO-TARGET DIFFERENTIAL GAME MODEL FOR MEDIUM-RANGE AIR COMBAT GAME ANALYSIS Semiannual Status Report, 1 Nov. 1984 - 30 Apr. 1985
Josef Shinar 1985 14 p refs
(Contract NCCw-4)
(NASA-CR-175968; NAS 1.26:175968; TR-160-473) Avail: NTIS

HC A02/MF A01 CSCL 12B

The first phase of an investigation of a two-target game, representing an air combat with boresight limited all-aspect guided missiles is summarized. The results, obtained by using a line of sight coordinate system, are compared to a similar recently published work. The comparison indicates that improved insight, gained by using line of sight coordinates, allows to discover important new features of the game solution. Author

N85-29237*# Iowa State Univ. of Science and Technology, Ames. Dept. of Electrical and Computer Engineering.
KALMAN FILTER MODELING
R. Grover Brown *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 261-272 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 12B

N85-29238*# Stanford Telecommunications, Inc., Santa Clara, Calif.
RELATIONSHIP BETWEEN ALLAN VARIANCES AND KALMAN FILTER PARAMETERS
A. J. VanDierendonck, J. B. McGraw, and R. Grover Brown (Iowa State Univ.) *In* NASA. Goddard Space Flight Center Proc. of the 16th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting 1984 p 273-293 refs (For primary document see N85-29221 18-35)
Avail: NTIS HC A21/MF A01 CSCL 12B

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

No abstracts in this category.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N85-29688 Department of the Air Force, Washington, D.C.
MEASUREMENT OF PERMITTIVITY AND PERMEABILITY OF MICROWAVE MATERIALS Patent
D. G. Aguirre, inventor (to Air Force) Issued 26 Mar. 1985 10 p Supersedes AD-D009776
(AD-D011656; US-Patent-4,507,602; US-Patent-Appl-SN-407985; US-Patent-Class-324-58) Avail: US Patent and Trademark Office CSCL 14/2

Using frequency domain techniques, the system measures the complex permittivity and permeability of different materials in Ku band (12.4 to 18 GHz). The measuring system comprises a dual horizontal-plane sectoral horn and sample holder assembly. The two horns are placed month-to-month with the sample holder betwen them. An input signal is supplied to one horn. The reflected signal from the sample comes back out from the same horn, while the transmitted signal goes through the sample and out via the other horn. The signal source is a frequency synthesizer. A network analyzer and a computer are used to determine the complex permittivity and permeability from the transmission and reflection signals. Author (GRA)

N85-29689*# National Aeronautics and Space Administration, Washington, D. C.
A NEW THEORY AIMING TO DEFINE THE MECHANISMS OF MATERIAL REMOVAL IN ELECTROEROSION
L. Chincholle Jun. 1985 29 p refs Transl. into ENGLISH of conf. paper "Nouvelle Theorie Visant a Definir le Mecanisme de l'Enlevement de Matiere en Electroerosion" Presented at the 4th Spring Workshop on Ind. Mech., France, 1974 p 1-17 Workshop held in Paris, 22-24 Apr. 1974 Original language document was announced in IAA as A74-39020 Submitted for publication Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-4005)
(NASA-TM-77875; NAS 1.15:77875) Avail: NTIS HC A03/MF A01 CSCL 14B

Formulation of an electrohydrodynamic hypothesis to explain the mechanism of material removal in electroerosion, and results of experiments designed to verify the validity of the proposed hypothesis is discussed. A hypothesis is proposed according to which material is removed by a high-power liquid microjet which forms as a result of implosion of a vapor cavity between the two electrodes. Using a model of the implosion of a vapor cavity, a study is made of the energy dissipated in the arc zone as a function of the expended electrical energy. A.B.K.

N85-29690# Argonne National Lab., Ill. Materials Science and Technology Div.
MAGNETISM AT INTERFACES AND SURFACES, AS PROBED BY NEUTRON SCATTERING
Gian Felcher Dec. 1984 13 p refs Presented at the Course on Dynamical Phenomena at Surfaces, Interfaces and Superlattices, Erice, Italy, 1-14 Jul. 1984
(Contract W-31-109-eng-38)
(DE85-007987; CONF-8407117-1) Avail: NTIS HC A02/MF A01

The diffraction of polarized neutrons from metal-metal superlattices, with one of the two metal magnetic, has yielded significant information on the microscopic distribution of magnetism, although the ultimate possibilities of the technique are yet sample-limited. Fresnel reflection of polarized neutrons from superconductors and ferromagnets is providing the depth profile of the magnetization close to the surface of these materials. DOE

N85-29691# Washington Univ., Seattle. Nuclear Physics Lab.
RESULTS FROM A BRAGG CURVE SPECTROMETER
D. D. Leach and K. J. Davis 1984 4 p ref Presented at the Instr. for Heavy Ion Nucl. Res. Conf., Oak Ridge, Tenn., 22 Oct. 1984
(Contract DE-AC06-81ER-40048)
(DE85-007870; DOE/ER-40048/112-L4; CONF-841005-10) Avail: NTIS HC A02/MF A01

The Bragg Curve Spectrometer (BCS) is an ionization chamber long enough to stop particles of interest. Particles enter through the cathode window and leave an ionization track parallel to the electric field. The ionization electrons drift through a Frisch grid and are collected on an anode. The anode current, as a function of time, is split and used as input for two amplifiers, one with a long integration time constant for energy measurement, and one with a short time constant to pick off the maximum ionization or Bragg peak. The Bragg peak, which is proportional to the nuclear charge, is used for particle identification. Several versions of the BCS have been constructed and tested. The results are described. DOE

N85-29692# Rome Univ. (Italy). Dipt. di Fisica.
ANDERSON LOCALIZATION FOR LARGE DISORDER OR LOW ENERGY
J. Froelich (Eidgenoessiche Technische Hochschule), F. Martinelli, E. Scoppola, and T. Spencer (New York Univ., New York) 12 Dec. 1984 51 p refs
(PREPRINT-426) Avail: NTIS HC A04/MF A01

Wave propagation with high degree of disorder (Anderson's localization phenomenon) is studied. The methods study the eigenfunctions of self-adjoint differential operators. Anderson's localization phenomenon in arbitrary dimensions is discussed. Transfer matrices and Furstenberg theorem of random matrices are discussed in the case of the Schroedinger equation.
Author (ESA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N85-29693* National Aeronautics and Space Administration. Pasadena Office, Calif.
GRAVITY ENHANCED ACOUSTIC LEVITATION METHOD AND APPARATUS Patent
Martin B. Barmatz (JPL, Pasadena, Calif.), James L. Allen (JPL, Pasadena, Calif.), and Dan Granett, inventors (to NASA) (JPL, Pasadena, Calif.) Issued 4 Jun. 1985 6 p Filed 9 Dec. 1983 Sponsored by NASA
(NASA-Case-NPO-16147-1-CU; US-Patent-4,520,656; US-Patent-Appl-SN-559988; US-Patent-Class-73-505) Avail: US Patent and Trademark Office CSCL 20A

An acoustic levitation system is provided for acoustically levitating an object by applying a single frequency from a transducer into a resonant chamber surrounding the object. The chamber includes a stabilizer location along its height, where the side walls of the chamber are angled so they converge in an upward direction. When an acoustic standing wave pattern is applied between the top and bottom of the chamber, a levitation surface within the stabilizer does not lie on a horizontal plane, but instead is curved with a lowermost portion near the vertical axis of the chamber. As a result, an acoustically levitated object is urged by gravity towards the lowermost location on the levitation surface, so the object is kept away from the side walls of the chamber.
Official Gazette of the U.S. Patent and Trademark Office

N85-29694*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
CORRELATION OF PREDICTED AND MEASURED SONIC BOOM CHARACTERISTICS FROM THE REENTRY OF STS-1 ORBITER
Frank Garcia, Jr., Jess H. Jones (NASA. Marshall Space Flight Center), and Herbert R. Henderson (NASA. Langley Research Center) Jun. 1985 49 p refs
(NASA-TP-2475; S-544; NAS 1.60:2475) Avail: NTIS HC A03/MF A01 CSCL 20A

Characteristics from sonic boom pressure signatures recorded at 11 locations during reentry of the Space Shuttle Orbiter Columbia are correlated with characteristics of wind tunnel signatures extrapolated from flight altitudes for Mach numbers ranging from 1.23 to 5.87. The flight pressure signature were recorded by microphones positioned at two levels near the descent ground-track along the California corridor. The wind tunnel signatures used in theoretical predictions were measured using a 0.0041-scale model Orbiter. The mean difference between all measured and predicted overpressures is 12 percent from measured levels. With one exception, the flight signatures are very similar to theoretical n-waves. Author

N85-29695# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
PASSIVATION ON HIGH Q ACOUSTIC STRAIN SENSOR FOR ACCELEROMETER Final Technical Report, 14 Feb. 1982 - 13 Jul. 1984
M. W. Motamedi Nov. 1984 39 p
(Contract F49620-82-C-0012)
(AD-A153565; MRDC-41108.3FR; AFOSR-85-0281TR) Avail: NTIS HC A03/MF A01 CSCL 20/1

The objective is to study the passivation effects on the frequency stability of SAW resonators. Cantilever SAW accelerometers based on the SAW resonator to the sensing element of acceleration is considered for a wide spectrum of Air Force applications. To produce the desired accuracy, a quartz beam is designed with the required sensitivity and a size adequate for the resonator structure. A theory of interface waves is developed for the purpose of material and thickness selection of passivation layers. Preliminary results indicated that Y2O3 (yttrium oxide) and AlN (aluminum nitride) were the best materials for passivation of SAW resonators. GRA

N85-29696# Naval Postgraduate School, Monterey, Calif.
AN EXPERIMENTAL STUDY OF THE PRESSURE IN A FAST BOTTOM BENEATH THE APEX OF AN OVERLYING FLUID WEDGE M.S. Thesis
M. K. Hedrick Dec. 1984 90 p
(AD-A153618) Avail: NTIS HC A05/MF A01 CSCL 20/1

The pressure profile in a fast bottom directly beneath the apex of a fluid wedge was investigated experimentally and compared with a computer model, which used saddle-point approximations based on image theory to predict the pressure under varying acoustical and geometrical parameters. Transducer fluid served as the fluid wedge overlying a water substrate. The fluid in the wedge was contained in an enclosed structure and was separated from the substrate by a thin Mylar membrane. The density ratio was 0.98 and the speed of sound ratio was 0.91. The experiment was conducted at a frequency of 88.2 kHz. Data were taken with the enclosure pressurized and nonpressurized for wedge angles of two through ten degrees, and with projector elevation angles at one-half and one-quarter the wedge angle. The experimental results agreed with theoretical predictions. Additionally, acceptable agreement was achieved between pressurized and nonpressurized conditions. GRA

N85-29697# Mississippi Univ., University. Physical Acoustics Research Lab.
STUDY OF SOUND ATTENUATION IN SEDIMENTS Ph.D. Thesis Final Technical Report
S. R. Addison and H. E. Bass Dec. 1984 73 p
(Contract N00014-79-C-0858)
(AD-A153690; AD-F300592; PARGUM-84-03) Avail: NTIS HC A04/MF A01 CSCL 20/1

This dissertation describes an experimental method by which the low-frequency attenuation of compressional waves in a sediment may be measured in the laboratory. The Biot and Hamilton models of sound propagation through sediments are reviewed. Measurements of attenuation in one laboratory sediment are presented, and the measured attenuation is compared to the predictions of the Biot and Hamilton models. The functional dependence of the attenuation measurements is of the form predicted by the Biot model, although the actual magnitude of the measured attenuation is higher than expected. The excess attenuation may be explained by the incomplete de-gassification of the sediment. GRA

N85-29698# Naval Research Lab., Washington, D. C. Surface Chemistry Branch.
SURFACE ACOUSTIC WAVE DEVICES AS CHEMICAL VAPOR MICROSENSORS Interim Report, Oct. 1982 - Oct. 1983
H. Wohltjen, A. W. Snow, and N. L. Jarvis 18 Apr. 1985 21 p refs
(AD-A153752; NRL-MR-5530) Avail: NTIS HC A02/MF A01 CSCL 09/1

This paper describes some of the operational characteristics and performance limitations of microfabricated sensors for chemical vapors which use surface acoustic wave (SAW) phenomena to probe a vapor sensitive coating. Comparisons are made with bulk wave piezoelectric crystal sensors and key technical challenges for future development of SAW vapor sensors are discussed. GRA

N85-29699# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
GEOACOUSTIC MODELS: WASHINGTON STATE CONTINENTAL MARGIN Final Report
D. M. Lavoie Jan. 1985 28 p
(AD-A153781; NORDA-85) Avail: NTIS HC A03/MF A01 CSCL 20/1

Knowledge of the Washington continental margin geology is critical in predicting acoustic response, since the region is a shallow-water, bottom-interacting area. The sediments are primarily terrigenous with less than 3% calcareous constituents on the shelf and slope and less than 10% calcareous constituents in the basin areas of the region. On the Washington continental shelf, sediments form bands of sands, silty sands, and muds that roughly parallel

the coastline as a result of prevailing current patterns. North of the Strait of Juan de Fuca, sediment grain-size patterns are highly irregular and include significant gravel deposits. The entire continental shelf is covered with only 150 meters and less of unconsolidated sediment. Sediment cover on the slope is more variable and ranges between a few meters on the tops of ridges to as much as 1600 meters in the valleys. The Cascadia Basin contains the thickest sediment (2500 meters) opposite the Columbia River and thins toward the Juan de Fuca Ridge. Acoustic basement is a siltstone beneath the shelf, a mudstone beneath much of the slope, and oceanic basalt beneath the deep-sea fans and basins. Seven geoacoustic provinces have been defined and mapped on the basis of sediment type and grain size. Each geoacoustic province has an accompanying geoacoustic model suitable for input to acoustic field models in which sediment physical properties are modeled as a function of depth. GRA

N85-29700# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
ACOUSTIC NOISE ASSOCIATED WITH THE MOD-1 WIND TURBINE: ITS SOURCE, IMPACT, AND CONTROL
N. D. Kelley, H. E. McKenna, R. R. Hemphill, C. L. Etter, R. L. Garrelts, and N. C. Linn Feb. 1985 262 p refs
(Contract DE-AC02-83CH-10093)
(DE85-002947; SERI/TR-635-1166) Avail: NTIS HC A12/MF A01

Extensive research by staff of the Solar Energy Research Institute and its subcontractors conducted to establish the origin and possible amelioration of acoustic disturbances associated with the operation of the DOE/NASA MOD-1 wind turbine installed in 1979 near Boone, North Carolina is summarized. Results have shown that the source of this acoustic annoyance was the transient, unsteady aerodynamic lift imparted to the turbine blades as they passed through the lee wakes of the large, cylindrical tower supports. Nearby residents were annoyed by the low-frequency, acoustic impulses propagated into the structures in which the complainants lived. The situation was aggravated further by a complex sound propagation process controlled by terrain and atmospheric focusing. Several techniques for reducing the abrupt, unsteady blade load transients were researched and are discussed. DOE

N85-28916# Loughborough Univ. of Technology (England).
ROTORCRAFT NOISE
J. B. Ollerhead *In* AGARD Helicopter Aeromech. Apr. 1985 38 p refs (For primary document see N85-28913 18-01)
Avail: NTIS HC A15/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N85-29701*# National Aeronautics and Space Administration. Pasadena Office, Calif.
GENERATION OF INTENSE NEGATIVE ION BEAMS Patent Application
Ara Chutjian (JPL, Pasadena, Calif.), Otto J. Orient (JPL, Pasadena, Calif.), and Samuel H. Aladzhadzhyan, inventors (to NASA) (JPL, Pasadena, Calif.) Filed 9 Apr. 1985 17 p
(Contract NAS7-918)
(NASA-Case-NPO-16061-1-CU; NAS 1.71:NPO-16061-1-CU; US-Patent-Appl-SN-729768) Avail: NTIS HC A02/MF A01 CSCL 20H

An electron gun is used with a mirror electrostatic field to produce zero or near zero velocity electrons by forming a turning point in their trajectories. A gas capable of attaching zero or near zero velocity is introduced at this turning point, and negative ions are produced by the attachment or dissociative attachment process. Operation may be continuous or pulsed. Ions thus formed are extracted by a simple lens system and suitable biasing of grids. NASA

N85-29702# National Aerospace Lab., Tokyo (Japan).
MONTE CARLO SIMULATION OF THERMALIZATION OF SUBEXCITATION ELECTRONS IN He, Ne, Ar, Kr AND Xe
Katsuhisa Koura Dec. 1984 17 p refs
(NAL-TR-843T; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The thermalization of subexcitation electrons in rare gases is studied with the Monte Carlo simulation (MCS). The electron velocity distribution is found to deviate significantly from the local Maxwellian distribution (MD) even for the initial Maxwellian distribution. Comparisons with available experimental results of the electron energy degradation as well as the electron thermalization time are made. A considerable discrepancy between the theoretical results obtained by the MCS and the approximate theory based on the MD assumption and the experimental results is revealed especially for rare gases with the Ramsauer minimum. The measured electron energy degradation is likely to be much less sensitive to the Ramsauer minimum than the theoretical one. Author

N85-29703# Mission Research Corp., Alexandria, Va.
FURTHER STUDIES OF THE NRL COLLECTIVE PARTICLE ACCELERATOR VIA NUMERICAL MODELING WITH THE MAGIC CODE Final Report, 1 Apr. - 30 Sep. 1984
R. J. Barker Aug. 1984 99 p
(Contract N00014-84-C-2136)
(AD-A153683; MRC/WDC-R-086) Avail: NTIS HC A05/MF A01 CSCL 09/2

The 2-D electromagnetic, relativistic simulation code, MAGIC, was used to investigate the detailed physics associated with the operation of the NRL CPA testbed experiment. Code results contradicted the original conclusions drawn from the experimental diagnostics in that the central beam always propagated with a current of 1-2kA in the numerical simulations while the experimental probes failed to detect that beam's presence in dual-beam mode of operation. Since 1-2kA was on the sensitivity threshold of their instruments used in the experiment, there is no reason to disbelieve the MAGIC results. This work argues in favor of a renewed CPA effect with improved diagnostics. GRA

N85-29704# Naval Postgraduate School, Monterey, Calif.
COMPARISON OF CALCULATIONS AND MEASUREMENTS OF THE OFF-AXIS RADIATION DOSE (SI) IN LIQUID NITROGEN AS A FUNCTION OF RADIATION LENGTH M.S. Thesis
P. F. Cromar Dec. 1984 73 p
(AD-A153676) Avail: NTIS HC A04/MF A01 CSCL 09/2

In this thesis results are presented from a study of the off-axis X and Gamma radiation field caused by a highly relativistic electron beam in liquid Nitrogen at various path lengths out to 2 radiation lengths. The off-axis dose in Silicon was calculated using electron/photon transport code CYLTRAN and measured using thermal luminescent dosimeters (TLD's). Calculations were performed on a CDC-7600 computer ar Los Alamos National Laboratory and measurements were made using the Naval Postgraduate School 100 Mev Linac. Comparison of the results is made and CYLTRAN is found to be in agreement with experimentally measured values. The CYLTRAN results are extended to the off-axis dose caused by a 100 Mev electron beam in air at Standard Temperature and Pressure (STP). GRA

N85-29705# Scientific Research Associates, Inc., Glastonbury, Conn.
NUMERICAL SOLUTIONS OF THE POTENTIAL DISTRIBUTION WITHIN THE VACUUM REGION OF THE FEATRON Final Report, Sep. 1983 - Oct. 1984
F. Davoudzadeh, D. V. Roscoe, R. C. Buggeln, and H. L. Grubin Mar. 1985 27 p
(Contract N00014-83-C-0719)
(AD-A153683; R85-920020-F) Avail: NTIS HC A03/MF A01 CSCL 20/8

This report described the development of a coordinate system generation procedure suitable for use in the numerical prediction of the physical operation of the FEATRON. The suitability of the coordinate system is demonstrated by application to a

simplified model of the equations governing charge distribution in the vacuum region of a single FEATRON cell. For this purpose, a solution to Laplace's equation subject to mixed Dirichlet and Neumann boundary conditions is presented. The numerical method used is the Linearized Block Implicit method of Briley and McDonald which is also described. GRA

N85-29706# Maryland Univ., College Park. Lab. for Plasma and Fusion Energy Studies.

EXPERIMENTAL AND THEORETICAL INVESTIGATION OF MICROWAVE AND MILLIMETER WAVE RADIATION FROM HOLLOW, ROTATING ELECTRON BEAMS Annual Progress Report, 1 Dec. 1983 - 30 Nov. 1984

William W. Destler 30 Dec. 1984 58 p refs
(Grant AF-AFOSR-0013-83)
(AD-A153827; AFOSR-85-0408TR) Avail: NTIS HC A04/MF A01 CSCL 20/7

Studies of the production of microwave and millimeter wave radiation from rotating electron beams have been pursued at the University of Maryland under AFOSR sponsorship since 1978. In the period 1978-1981, these studies centered the braodband radiation produced when a rotating electron beam interacts with the TE and/or TM modes of a smooth cylindrical conducting boundary system. These early studies led in 1981 to the first demonstration of a new type of coherent radiation source at microwave and millimeter wave wavelengths with demostrable advantages over existing sources. This device, informally called a Cusp Injected Magnetron of Cusptron by members of our group, produces radiation by the resonant interaction of a rotating electron beam with the modes of a magnetron-type conducting boundary. GRA

N85-29707# Naval Research Lab., Washington, D. C. Advanced Accelerator Program.

RAPID ELECTRON BEAM ACCELERATORS (REBA-TRONS) Interim Report

C. A. Kapetanakos, P. Sprangle, S. J. Marsh (Sachs/Freeman Associates, Bowie, Md.), D. Dialetis (Science Applications International Corp.), C. Agritellis (Science Applications International Corp.), and A. Prakash (Ballistic Research Lab.) 25 Apr. 1985 58 p refs
(AD-A153835; NRL-MR-5503) Avail: NTIS HC A04/MF A01 CSCL 20/7

We have carried out an extensive numerical and analytical investigation of the beam dynamics in a rebatron accelerator. In this device acceleration occurs by a localized, high gradient electric field and beam confinement is achieved by a strong focusing torsatron magnetic field. In a rebatron, beam acceleration occurs in a few microseconds and limitations imposed by instabilities, field errors and radiation losses can be relaxed. Our studies indicate that both the bandwidth and the maximum electron beam current than can be confined by these devices is remarkably high. GRA

N85-29708# Polytechnic Inst. of New York, Farmingdale. Dept. of Electrical Engineering.

MILLIMETER WAVE GENERATION BY RELATIVISTIC ELECTRON BEAMS Annual Report, 1 Oct. 1983 - 30 Sep. 1984

Spencer S.-P. Kuo and Bernard R.-S. Cheo 1 Dec. 1984 131 p refs
(Grant AF-AFOSR-0001-83; AF Proj. 2301)
(AD-A153980; POLY-84-007; AFOSR-85-0342TR) Avail: NTIS HC A07/MF A01 CSCL 20/9

We are studying various wave-plasma interaction processes towards the understanding of the collective physics of plasmas. The processes include the mechanisms leading to the generation of millimeter waves by relativistic electron beams (electron cyclotron maser instability) and the mechanisms providing channels for anomalous absorption of electromagnetic waves (electron cyclotron resonance heating and parametric instabilities). A single nonlinear equation which describes the temporal evolution of the field amplitude of the electron cyclotron maser instability has been derived self-consistently. Three adiabatic invariants of the electron motion under the electon cyclotron resonance heating by three differently polarized heater: (1) ordinary mode; (2) extra-ordinary mode; and (3) electrostatic mode are derived. Wave plasma interaction leading to various parametric instabilities in the ionsphere has also been studied. GRA

N85-29709# Sandia Labs., Albuquerque, N. Mex.

ELECTRONIC STRUCTURE CALCULATIONS FOR LOW COVERAGE ADLAYERS

P. J. Feibelman 1984 45 p refs Presented at the Texas A and M Symp. on Theory and Modeling for Mater. Design, College Station, Tex., 17 Sep. 1984
(DE85-007733; SAND-85-0174C; CONF-8409210-1) Avail: NTIS HC A03/MF A01

An important direction for surface electronic structure calculations in the next few years will be the study of low coverage adsorption systems. This presentation attempts to explain why. A present-day brute-force low coverage calculation is illustrated. An efficient method for low coverages that is under development is discussed. DOE

N85-29710# California Univ., Berkeley. Lawrence Berkeley Lab. Nuclear Science Div.

S-MATRIX THEORY OF NUCLEAR FORCES

R. Vinh Mau Sep. 1984 24 p refs Presented at the G. F. Chew Jubilee, Berkeley, Calif., 29 Sep. 1984
(Contract DE-AC03-76SF-00098)
(DE85-007633; LBL-18973; CONF-8409208-1) Avail: NTIS HC A02/MF A01

The use of the S-matrix theory for deriving the nucleon-nucleon interaction is reviewed. Fits to recent NN data are described. Applications to nuclear structure properties and nucleon-nucleus reactions are discussed, and the results compared with data. DOE

N85-29711# Maryland Univ., College Park. Dept. of Physics and Astronomy.

DEVELOPMENT OF THE RELATIVISTIC IMPULSE APPROXIMATION

S. J. Wallace 1985 29 p refs Presented at Workshop on Dirac Approaches to Nucl. Phys., Los Alamos, N. Mex., 31 Jan. 1985
(Contract DE-AS05-76ER-05126)
(DE85-008505; DOE/ER-05126/245; ORO-5126-245; CONF-850163-1) Avail: NTIS HC A03/MF A01

The developments which led to the relativistic impulse approximation for proton-nucleus scattering are reviewed. Problems with the impulse approximation in its original form, principally the low energy problem, are discussed and traced to pionic contributions. Use of pseudovector covariants in place of pseudoscalar ones in the NN amplitude provides more satisfactory low energy results, however, the difference between pseudovector and pseudoscalar results is ambiguous in the sense that it is not controlled by NN data. Only with further theoretical input can the ambiguity be removed. A complete NN amplitude representation is developed and a complete set of Lorentz invariant amplitudes are calculated based on a one-meson exchange model and appropriate integral equations. A meson theoretical basis for the important pair contributions to proton-nucleus scattering is established by the new developments. DOE

N85-29712# California Univ., Berkeley. Lawrence Berkeley Lab.

SOME COMMENTS ON SSC PHYSICS

I. Hinchliffe Jan. 1985 23 p refs Presented at Aspen Winter Phys. Conf., Aspen, Colo., 14 Jan. 1985
(Contract DE-AC03-76SF-00098)
(DE85-008444; LBL-19051; CONF-850146-4) Avail: NTIS HC A02/MF A01

Some topics of current interest with regard to Superconducting Super Collider physics are discussed. Uncertainties in rate estimates are discussed as is the status of proposals to search for the Higgs boson. DOE

N85-29713# Stanford Linear Accelerator Center, Calif.

WIDE-ANGLE OPTICS WITH STRONG MAGNETIC FIELDS FOR EFFICIENT GENERATION OF SECONDARY-PARTICLE BEAMS

B. F. Bayanov, G. i. Budker, G. S. Villevald, T. A. Vsevolozhskaya, L. L. Danilov, V. N. Karasyuk, G. I. Silvestrov, V. A. Tayurskiy, and A. D. Chernyakin May 1984 9 p refs Transl. from Proc. of 10th Intern. Conf. on High-Energy Accelerators (Protovino, Italy), v. 2, Jul. 1977 p 103-109
(Contract DE-AC03-76SF-00515)
(DE85-007727; SU-SLAC-Trans-0213) Avail: NTIS HC A02/MF A01

Optimization of the conditions for producing beams of secondary particles (positrons, antiproton, PI-mesons) has led to the development of projects at the Institute of Nuclear Physics of the Siberian Branch of the USSR Academy of Sciences aimed at creating optical devices with strong (50 to 300 kOE) pulsed magnetic fields and with a wide range of parameters determined by the type of secondary particles, their energy and the requirements for the beam characteristics. This theme encompasses two areas: the development of so-called parabolic lenses consisting of thin-walled shells of revolution about which current flows and which, by assigning the appropriate shape, facilitate aberration free focusing of the particles for practically any collection angles, and of cylindrical lenses made of light metal (lithium, sodium) with cross sectionally uniform current density distribution for short focusing of beams. DOE

N85-29714# Oak Ridge National Lab., Tenn. Physics Div.
EXCITED STATE POPULATIONS AND CHARGE-EXCHANGE OF FAST IONS IN SOLIDS
P. D. Miller, C. J. Sofield (UKAEA), C. J. Woods (UKAEA), N. E. B. Cowern (UKAEA), L. B. Bridwell (Southwest Missouri State Univ.), C. D. Moak, D. C. Gregory, C. M. Jones, G. D. Alton, and P. L. Pepmiller 1984 9 p refs Presented at the 8th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12-14 Nov. 1984
(Contract DE-AC05-84CR-21400)
(DE85-009362; CONF-841117-52) Avail: NTIS HC A02/MF A01

Excited state populations and charge state fractions of 445 MeV Cl ions were measured for a range of thicknesses of solid O targets. Cross sections for electron capture, loss, excitation and excited state quenching were determined and these data are found to predict a quantitative difference between equilibrium charge state distributions from gases and solids for a special case of the Bohr-Lindhard density effect model. DOE

N85-29715# California Univ., Berkeley. Lawrence Berkeley Lab. Accelerator and Fusion Research Div.
PHASE AND AMPLITUDE CONSIDERATIONS FOR THE 2-BEAM ACCELERATOR
R. W. Kuenning, A. M. Sessler, and J. S. Wurtele (MIT) Feb. 1985 8 p refs Presented at the 2nd Intern. Workshop on Laser Acceleration of Particles, Malibu, Calif., 7-18 Jan. 1985 Sponsored in part by Navy
(Contract DE-AC03-76SF-00098)
(DE85-008455; LBL-19064; CONF-850128-5) Avail: NTIS HC A02/MF A01

Phase and amplitude considerations for a two-beam accelerator and analytic formulas are obtained expressing the phase and amplitude errors in terms of magnetic wiggler errors, beam energy errors, beam current errors, and microwave field amplitude errors. The necessity of phase and amplitude control is shown and schemes are proposed which can accomplish this control. DOE

N85-29716# Argonne National Lab., Ill. Fusion Power Program.
SPECTER: NEUTRON DAMAGE CALCULATIONS FOR MATERIALS IRRADIATIONS
Lawrence R. Greenwood and Robert K. Smither Jan. 1985 65 p refs
(Contract W-31-109-eng-38)
(DE85-005791; ANL/FPP-TM-197) Avail: NTIS HC A04/MF A01

Neutron displacement damage-energy cross sections were calculated for 41 isotopes in the energy range from 10(-10) to 20 MeV. Elastic scattering is treated exactly including angular distributions from ENDF/B-V. Inelastic scattering calculations consider both discrete and continuous nuclear level distributions. Multiple (n,xn) reactions use a Monte Carlo technique to derive the recoil distributions. The (n,d) and (n,t) reactions are treated as (n,p) and (n(3)He) as (n,(4)He). The (n,(GAMMA)) reaction and subsequent (BETA)-decay are also included, using a new treatment of (GAMMA)-(GAMMA) coincidences, angular correlations, (BETA)-neutrino correlations, and the incident neutron energy. The Lindhard model was used to compute the energy available for nuclear displacement at each recoil energy. The SPECTER computer code was developed to simplify damage calculations. The user need only specify a neutron energy spectrum. SPECTER will then calculate spectral-averaged displacements, recoil spectra, gas production, and total damage energy (Kerma). DOE

N85-29717# Los Alamos Scientific Lab., N. Mex.
ACCELERATOR TECHNOLOGY WORKING GROUP SUMMARY
R. A. Jameson 1985 12 p refs Presented at 2nd Intern. Workshop on Laser Acceleration of Particles, Los Angeles, 7 Jan. 1985
(Contract W-7405-eng-36)
(DE85-009547; LA-UR-85-882) Avail: NTIS HC A02/MF A01

A summary is presented of workshop deliberations on basic scaling, the economic viability of laser drive power for HEP accelerators, and the availability of electron beam injectors for near term experiments. General remarks on technology issues are presented. DOE

N85-29718# Alabama Univ., University. Dept. of Physics and Astronomy.
A COMPREHENSIVE STUDY OF PSI MESON PRODUCTION Progress Report
Stanley T. Jones and Benjamin C. Harms 22 Feb. 1985 12 p refs
(Contract DE-FG05-84FR-40141)
(DE85-008094; DOE/ER-40141/1) Avail: NTIS HC A02/MF A01

The first paper under this grant is a calculation of prompt lepton production in upsilon and toponium decay. The results should prove useful in identifying signals for charm or bottom production. Psi production in hadronic interactions was investigated. Attempts to explain the difference between experimental and theoretical rates of psi hadroproduction led to a study of quark gluon scattering, which proved to have a negative impact on the theoretical cross section once a leading mass singularity was absorbed into the gluon distribution function. The study of psi production in B meson decays has led to an improvement in the leading log calculation of this rate, which gives a much more precise prediction of the decay rate. All first order QCD corrections to this weak process have been calculated. Work outside the realm of QCD has included a new fit to the total pp and anti pp cross sections. Dr. Cox has also been pursuing the question of representations of extended (especially N=8) supersymmetry. DOE

N85-29719# Sandia Labs., Albuquerque, N. Mex. Plasma Theory Div.
CALCULATIONS OF BEAM DYNAMICS IN SANDIA LINEAR ELECTRON ACCELERATORS, 1984
J. W. Poukey and P. D. Coleman Mar. 1985 62 p refs
(Contract DE-AC04-76DP-00789)
(DE85-010417; SAND-84-2652) Avail: NTIS HC A04/MF A01

A number of code and analytic studies were made during 1984 which pertain to the Sandia linear accelerators MABE and RADLAC. The important results of the calculations are summarized. New results include a better understanding of gap induced radial oscillations, leakage currents in a typical MABE gas, emittance growth in a beam passing through a series of gaps, some new diocotron results, and the latest diode simulations for both accelerators. DOE

N85-29720# California Univ., Livermore. Lawrence Livermore Lab.
MAXIMUM CURRENT DENSITIES FROM TANDEM HIGH DENSITY SYSTEMS
J. R. Hiskes, A. M. Karo, and P. A. Willmann 14 Mar. 1985 8 p refs Presented at the IAEA Tech. Comm. Meeting on Negative

Ion Beam Heating, Grenoble, France, 20 Mar. 1985
(Contract W-74305-eng-48)
(DE85-008966; UCRL-92344; CONF-8503122-1) Avail: NTIS HC A02/MF A01

The tandem high density negative-ion-source system is optimized to identify the largest possible ion concentrations and extracted ion currents. The optimization includes varying the length of the second chamber, varying neutral gas and electron densities, and varying the ratio of atomic to molecular density. The electron excitation processes, e-V and E-V, are taken into account in the first chamber. Negative ions are formed through dissociative attachment in the second chamber. DOE

N85-29721# Los Alamos Scientific Lab., N. Mex.
ELECTRON MULTIPLE, PLURAL AND SINGLE SCATTERING
Joseph J. Devaney Mar. 1985 37 p refs
(Contract W-7405-eng-36)
(DE85-010325; LA-10272-MS) Avail: NTIS HC A03/MF A01

The angular distribution of a beam of electrons penetrating an infinite slab is studied with a view to providing simple accurate formulae for use in electron transport codes. The theory suffers from complexity, from incomplete, erroneous, or even absent comparisons with other theories and with experiment. The theory of Moliere as given by Bethe and by Hanson, et al., is recommended. Formulas are given. Accuracies of a few percent for multiple scattering are expected. For the (in the cases studied) less dominant concomitant plural and single scattering the theory cannot do better than 10 to 30%. Because of the complexity of the functions, either series or tables must be employed. Using theories of Hanson, et al., and variants thereof, an approximate Gaussian gives a good (7 to 20% error) simple description of the multiple scattering. Approximate single scattering formulas are also offered. DOE

N85-29722# Tennessee Univ., Knoxville.
ELECTRON CAPTURE TO THE CONTINUUM FROM ATOMIC HYDROGEN
G. A. Glass, P. Engar, S. D. Berry, M. Breinig, R. Deserio, S. B. Elston, and I. A. Sellin 1984 13 p Presented at the 8th Conf. on the Appl. of Accelerators in Res. and Ind., Denton, Tex., 12 Nov. 1984 Prepared in cooperation with ORNL, Tenn.
(Contracts DE-AC05-84CR-21400; DE-AS05-79ER-10512)
(DE85-005269; CONF-841117-43) Avail: NTIS HC A02/MF A01

The first known measurement of the differential cross section for electron capture to the continuum(FCC) from atomic hydrogen is presented. A 12 MeV beam of C(6+) ions traversed a static target of atomic hydrogen produced by an electron impact heated dissociation oven. The resulting ECC spectrum was obtained with a channel electron multiplier detector mounted at the exit of a 160(0) spherical sector electrostatic spectrometer with an angular acceptance of 2(0). the FCC spectrum clearly shows the asymmetry generally associated with ECC spectra from gaseous targets. The ratio of the singly differential cross section of H to that of H2 was found to be 0.80. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

N85-29723# Stanford Linear Accelerator Center, Calif.
WEAK INTERACTIONS OF QUARKS AND LEPTONS: EXPERIMENTAL STATUS
S. Wojcicki Sep. 1984 76 p Presented at the 12th SLAC Summer Inst. on Particle Phys., Stanford, Calif., 23 Jul. 1984
(Contracts DE-AC03-76SF-00515; DE-AC03-81ER-40050)
(DE85-008171; SU-SLAC-PUB-3431; CONF-8407112-3) Avail: NTIS HC A05/MF A01

The present experimental status of weak interactions is discussed with emphasis on the problems and questions and on the possible lines of future investigations. Major topics include: (1) the quark mixing matrix, (2) CP violation, (3) rare decays, (4) the lepton sector, and (5) right handed currents. DOE

N85-29724# Stanford Linear Accelerator Center, Calif.
MEASUREMENTS OF HEAVY QUARK AND LEPTON LIFETIMES
J. A. Jaros Feb. 1985 14 p refs Presented at the 12th SLAC Summer Inst. on Particle Phys., Stanford, Calif., 23 Jul. 1984
(Contract DE-AC03-76SF-00515)
(DE85-008321; SU-SLAC-PUB-3569; CONF-8407112-5) Avail: NTIS HC A02/MF A01

The PEP/PETRA energy range has proved to be well-suited for the study of the lifetimes of hadrons containing the b and c quarks and the tau lepton for several reasons. First, these states comprise a large fraction of the total interaction rate in e(+)e(-) annihilation and can be cleanly identified. Second, the storage rings have operated at high luminosity and so produced these exotic states copiously. And finally, thanks to the interplay of the Fermi coupling strength, the quark and lepton masses, and the beam energy, the expected decay lengths are in the 1/2 mm range and so are comparatively easy to measure. This pleasant coincidence of cleanly identified and abundant signal with potentially large effects has made possible the first measurements of two fundamental weak couplings, tau (YIELDS) nu/sub tau/W and b (YIELDS) cW. These measurements have provided a sharp test of the standard model and allowed, for the first time, the full determination of the magnitudes of the quark mixing matrix. DOE

N85-29725# Argonne National Lab., Ill. Chemical Technology Div.
EXPECTED BEHAVIOR OF PLUTONIUM IN THE IFR FUEL CYCLE
R. K. Steunenberg and Irving Johnson 1985 6 p refs
(Contract W-31-109-eng-38)
(DE85-006225; CONF-850610-3) Avail: NTIS HC A02/MF A01

The Integral Fast Reactor (IFR) is a metal-fueled, sodium-cooled reactor that will consist initially of a U-Zr alloy core in which the enriched uranium will be replaced gradually by plutonium bred in a uranium blanket. The plutonium is concentrated to the required level by extraction from the molten blanket material with a CaCl2-BaCl2 salt containing MgCl2 as an oxidant (halide slagging). The CaCl2-BaCl2 salt containing dissolved PuCl3 and UCl3 is added to the core process where fission products are removed by electrorefining, using a liquid cadmium anode, a metal cathode, and a LiCl-NaCl-CaCl2-BaCl2 molten salt electrolyte. The product is recovered as a metallic deposit on the cathode. The Halide slagging step is operated at about 1250 deg and the electrorefining step at about 450 C. These processes are expected to give low fission-product decontamination factors of the order of 100. DOE

N85-29726# California Univ., Livermore. Lawrence Livermore Lab.
PULSE STAR INERTIAL CONFINEMENT FUSION REACTOR
J. A. Blink and W. J. Hogan 15 Apr. 1985 6 p refs Presented at 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-7405-eng-48)
(DE85-010940; UCRL-91643; CONF-850310-89) Avail: NTIS HC A02/MF A01

Pulse Star is a pool-type inertial confinement fusion reactor that emphasizes low cost and high safety levels. The reactor consists of a vacuum chamber (beliljar) submerged in a compact liquid metal (Li17Pb83 or lithium) pool which also contains the heat exchangers and liquid metal pumps. The shielding efficiency of the liquid metal pool is high enough to allow hands-on maintenance of (removed) pumps and heat exchangers. Liquid metal is allowed to spray through the 5.5 m radius beliljar at a controlled rate, but is prohibited from the target region by a 4 m radius mesh first wall. The wetted first wall absorbs the fusion X-rays and debris while the spray region absorbs the fusion

neutrons. The mesh allows vaporized liquid metal to blow through to the spray region where it can quickly cool and condense. Preliminary calculations show that a 2 m thick first wall could handle the mechanical (support, buckling, and X-ray-induced hoop) loads. Wetting and gas flow issues are in an initial investigation stage. DOE

N85-29727# Stanford Linear Accelerator Center, Calif.
ENERGY DEPOSITION AND ITS EFFECTS ON THE E+ CAPTURE SECTION AT SECTOR 20
James F. Kramer 29 Apr. 1985 19 p
(Contract DE-AC03-76SF-00515)
(DE85-010964; SU-SLAC-CN-294) Avail: NTIS HC A02/MF A01

The temperature profile and resulting stresses and strains of the capture section (positron source accelerator section) at Sector 20 were investigated. The Electron-Gamma Shower program, Version 4 (EGS4) was used to determine energy deposition. For a 31.68 kW, 33 GeV electron beam, the rate of energy deposition in the first accelerator disk downstream from the 90/10 tantalum tungsten positron target was determined to be 0.56 kW. The calculated resulting temperature difference from the inner diameter could then reach a temperature of 169.5 F. The maximum stress produced in this first disk would be a compressive stress of 4374 psi, also at the inner diameter. DOE

N85-29728# Los Alamos Scientific Lab., N. Mex.
KrF LASER COST/PERFORMANCE MODEL FOR ICF COMMERCIAL APPLICATIONS
D. B. Harris and J. H. Pendergrass 1985 7 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contract W7405-eng-36)
(DE85-009589; LA-UR-85-747; CONF-850310-49) Avail: NTIS HC A02/MF A01

Simple expressions suitable for use in commercial-applications plant parameter studies for the direct capital cost plus indirect field costs and for the efficiency as a function of repetition rate were developed for pure-optical-compression KrF laser fusion drivers. These simple expressions summarize estimates obtained from detailed cost-performance studies incorporating recent results of ongoing physics, design, and cost studies. Contributions of KrF laser capital charges and D and M costs to total levelized constant-dollar (1984) unit ICF power generation cost are estimated as a function of plant size and driver pulse energy using a published gain for short-wavelength lasers and representative values of plant parameters. DOE

N85-29729# Argonne National Lab., Ill.
RADIONUCLIDE MOBILITY IN THE SHALLOW PORTION OF AN ACTIVE HIGH-TEMPERATURE GEOTHERMAL SYSTEM
Neil C. Sturchio and Martin G. Seitz 1984 8 p refs Presented at the US/FRG Tech. Exchange on Geochem. of Radionuclide Migration, Argonne, Ill., 3 Dec. 1984
(Contract W-31-109-eng-38)
(DE85-010293; CONF-841245-2) Avail: NTIS HC A02/MF A01

Accurate knowledge of the behavior of radionuclides in natural rock-water systems is crucial for the prediction of the consequences of failure of a high-level nuclear waste repository. Work in progress at Argonne National Laboratory involves the detailed geochemical analysis of rock, mineral, and water samples from shallow drill holes in a thermal area of Yellowstone National Park. This study is designed to provide data that will increase our understanding of the behavior of a group of radionuclides in an environment similar to that of the near field of a high-level nuclear waste repository. DOE

N85-29730# Oak Ridge National Lab., Tenn.
AN ALPHA PARTICLE DIAGNOSTIC BEAM LINE SYSTEM TO GENERATE AN INTENSE LI(O) BEAM WITH AN ORNL SITEX SOURCE
W. K. Dagenhart 1985 7 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-010564; CONF-850310-83) Avail: NTIS HC A02/MF A01

The surface ionization with transverse extraction (SITEX) negative ion source utilizes a 100-V/20-A reflex arc discharge in a 1300 gauss magnetic field to generate Cs+ ions and H+ or D+ ions, depending on the beam required. A shaped molybdenum plate is placed directly behind the arc column. Cesium coverage on this plate is used to minimize the surface work function, which requires two thirds of a monolayer coverage. Cesium coverage is adjusted both by cesium flow control into the arc discharge chamber and by temperature control of the converter using gaseous helium cooling channels in the converter plate. Normal converter operational temperatures are 300 C to 500 C H(-)/D(-) beams are generated at the biased converter surface by Cs(+) sputtering of absorbed hydrogen or deuterium and by the reflection conversion mechanism of H(+)/D(+) ions which strike the converter surface at 150 eV. The negative ions are accelerated through the 150-V plasma sheath at the converter surface and are focused by the converter geometry and magnetic field so as to pass through the exit aperture with minimum angular divergence. The ion optics of the SITEX accelerator is calculated by ORNL 3-D optics code and results in a divergence perpendicular to the slot of theta/sub perpendicular rms/ = 0.35(0). This beam divergence should be adequate for injection into a radio frequency quadrupole (RFQ) for further acceleration. DOE

N85-29731# Texas A&M Univ., College Station. Dept. of Physics.
INTERMEDIATE ENERGY NUCLEAR THEORY Final Report 1 Jul. 1976 - 31 Aug. 1984
R. A. Bryan Feb. 1985 25 p
(Contract DE-AS05-76ER-05223)
(DE85-010440; DOE/ER-05223/69) Avail: NTIS HC A02/MF A01

We summarize the research accomplishments of the Texas A and M. Research was mainly in the area of nucleon-nucleon and NN(PI) theory and data analysis, although some effort was also devoted to the elementary particle aspects of these hadrons in order to better understand the NN force. Publications and reports are listed. DOE

N85-29732# California Univ., Livermore. Lawrence Livermore Lab.
PHYSICS-MAGNETICS TRADE STUDIES FOR TANDEM MIRROR REACTORS
R. B. Campbell, L. J. Perkins, and D. T. Blackfield (ORNL, Tenn.) 1 Mar. 1985 7 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contracts W-7405-eng-48; DE-AC05-84OR-21400)
(DE85-010043; UCRL-92098; CONF-850310-57) Avail: NTIS HC A02/MF A01

Results obtained from the optimization package of the Tandem Mirror Reactor Systems Code are presented. It is very useful in searching through multidimensional parameter space, and have applied it here to study the effect of choke coil field strength and net electric power on cost of electricity (COE) and mass utilization factor (MUF) for MINIMARS type reactors. We have found that a broad optimum occurs at B/sub choke/ = 26 T for both COE and MUF. The COE economy of scale approaches saturation at quite low powers, around 600 MW(e). The saturation is mainly due to longer construction times for large plants, and the associated time related costs. The MUF economy of scale does not saturate, at least for powers up to 2400 MW(e). DOE

N85-29733# American Inst. of Physics, New York.
PHYSICS OF HIGH ENERGY PARTICLE ACCELERATORS. AIP CONFERENCE PROCEEDINGS NO. 127
Melvin Month, ed. (Brookhaven National Lab.), Per F. Dahl, ed., and Margaret Dienes, ed. 1985 983 p refs Conf. held in Upton, N.Y. and Stony Brook, N.Y., 6-16 Jul. 1983 Sponsored in cooperation with NSF
(Contract DE-AC02-76CH-00016)
(DE85-008891; CONF-8307126; LC-85-70057;

ISBN-0-88318-326-9) Avail: NTIS HC A99/MF E04
Topics covered in this workshop include accelerator physics, particle physics, and new acceleration methods. Eighteen lectures were presented. DOE

N85-29734# Argonne National Lab., Ill. Materials Science and Technology Div.
THEORY OF POSITRON ANNIHILATION IN VACANCIES IN CONCENTRATED DISORDERED ALLOYS
R. Prasad, R. Benedek, and A. Bansil (Northeastern Univ.) Jan. 1985 4 p refs Presented at the 7th Intern. Conf. on Positron Annihilation, New Delhi, 6-11 Jan. 1985
(Contract W-31-109-eng-38)
(DE85-010267; CONF-850169-6; M85010267) Avail: NTIS HC A02/MF A01
A theory of the two-photon momentum density for positrons trapped in vacancies in concentrated substitutional binary alloys was developed within the framework of the KKR-CPA method. The ultimate objective is to obtain information regarding the local environment of vacancies in alloys by comparison of predicted momentum distributions with the results of 2D-ACAR experiments. The theory is formulated in terms of muffin-tin wavefunctions and real-space path operators for the electrons and the vacancy-trapped positron. Partial results are presented for a vacancy in pure Cu. DOE

N85-29735# Argonne National Lab., Ill. Applied Physics Div.
FAST-NEUTRON-SPECTRUM MEASUREMENTS FOR THE THICK-TARGET (9)Be(d,n)(10)B REACTION AT E/sub d/ = 7 MeV
D. L. Smith, J. W. Meadows, and P. T. Guenther Apr. 1985 40 p refs
40 p refs
(Contract W-31-109-eng-38)
(DE85-010481; ANL/NDM-90; M85010481) Avail: NTIS HC A03/MF A01
Spectra of neutrons with energies greater than or equal to 800 keV which are emitted from a metallic beryllium target that is thick enough to completely stop 7-MeV incident deuterons are measured using organic scintillators and the pulse-beam time-of-flight method. Data are acquired for 20 different emission angles in the laboratory over the range 0 to 155 degrees. The resulting information on the energy-angle detail of neutron emission is then employed in calculations which are performed in order to examine certain effects of the anisotropic neutron production on typical measurements of integral fast-neutron reaction cross sections. DOE

N85-29736# Stanford Linear Accelerator Center, Calif.
SELECTED TOPICS FROM J/PSI DECAYS
Allen Odian Feb. 1985 4 p Presented at the Am. Phys. Soc. Meeting, Santa Fe, N. Mex., 31 Oct. 1984
(Contract DE-AC03-76SF-00515)
(DE85-010537; SU-SLAC-PUB-3589; CONF-8410222-19) Avail: NTIS HC A02/MF A01
Branching ratios for J/psi radiative decays are given, and the spin parity assignments for iota and theta(1640) were determined to be 0(-) and 2(+), respectively. DOE

N85-29737# Idaho National Engineering Lab., Idaho Falls.
PRELIMINARY PROPOSAL FOR A BERYLLIUM TECHNOLOGY PROGRAM FOR FUSION APPLICATIONS
Feb. 1985 47 p refs Prepared in cooperation with California Univ., Livermore. Lawrence Livermore Lab. and Hanford Engineering Development Lab., Richland, Wash.
(Contract DE-AC07-76ID-01570)
(DE85-009815; DOE/ID-01570/T95) Avail: NTIS HC A03/MF A01
A program was designed to provide the answers to the critical issues of beryllium technology needed in fusion blanket designs. The four tasks are as follows: (1) beryllium property measurements needed for fusion data base; (2) beryllium stress relaxation and creep measurements for lifetime modelling calculations; (3) simplified recycle technique development for irradiated beryllium; (4) beryllium multiplier measurements using manganese bath absolute calibration techniques. DOE

N85-29738# California Univ., Berkeley. Lawrence Berkeley Lab. Center for X-Ray Optics.
COHERENT X-RAYS AND VACUUM-ULTRAVIOLET RADIATION FROM STORAGE-RING-BASED UNDULATORS AND FREE ELECTRON LASERS
Kwang-Je Kim, ed. Dec. 1984 72 p refs
(Contract DE-AC03-76SF-00098)
(DE85-009968; LBL-18945) Avail: NTIS HC A04/MF A01
High brightness electron storage rings and permanent magnet technology provide a basis for the development of coherent radiation in the 10 to 1000 A (xuv) spectral range. The most assured route to the production of coherent X-rays and vuv is the simple interaction between properly constrained relativistic electrons and permanent magnet undulators, a subject that is already well understood and where technology is well advanced. Other techniques are less well developed, but with increasing degrees of technical challenge they will provide additional coherent properties. Transverse optical klystrons (TOKs) provide an opportunity for additional coherence at certain harmonics of longer wavelength lasers. Free electron lasers (FELs) extend coherence capabilities substantially through two possible routes: one is the development of suitable mirror coatings. Both FEL techniques would provide vuv radiation and soft X-rays with extremely narrow spectral content. Research on all of these techniques (undulators, TOKs, and FELs) in a high brightness electron storage ring, referred to herein as a Coherent xuv Facility (CXF) is discussed. DOE

N85-29739# Argonne National Lab., Ill.
3D CALCULATIONS OF A FIXED FIELD ALTERNATING GRADIENT SYNCHROTRON MAGNET
Robert J. Lari 1985 5 p Presented at the 5th Conf. on the Computation of Electromagnetic Fields, Fort Collins, Colo., 3 Jun. 1985
(Contract W-31-109-eng-38)
(DE85-002742; CONF-850641-1) Avail: NTIS HC A02/MF A01
A Spallation neutron source for materials science studies was designed at Argonne and required a fixed field alternating gradient (FFAG) synchrotron magnet. 3D electrostatic calculations were made to obtain the unsaturated magnet pole shape. This pole shape was refined using 3D magnetostatic calculations that included the steel permeability and coil geometry. Details of the calculations are given. DOE

N85-29740# Illinois Univ., Urbana. Fusion Studies Lab.
NEW CONCEPT FOR A WALL DETECTOR FOR ALPHA PARTICLES
G. H. Miley, H. Kislev, and B. J. Micklich 1985 6 p refs Presented at the Ann. Meeting of the Am. Nucl. Soc., Boston, 9-14 Jun. 1985
(DE85-009037; COO-2218-313; CONF-850610-25) Avail: NTIS HC A02/MF A01
A new concept for a wall-mounted detector is described here that would measure D-T alpha flux and corresponding pitch angle distribution in Tokamaks (or related toroidal devices). The sensing element is a conical Micro Channel Ring (MCR) coated with 1 to 2 MU of ZnS scintillator (or possibly ZnO). The collimation of the ALPHA particles is provided by two circumferential slots at the wall surface. The alpha scintillation events on the MCR are transferred through the ring channels and coupled fiber optics bundle to an external processor. From the magnetic field vector at a given point on the device wall, a certain relation can be set up between the ALPHA-induced scintillation position on the MCR and its original pitch angle (i.e., the angle between the ALPHA emission from the fusion reaction and the magnetic field vector) which is equal to the local pitch angle since the wall ALPHA flux is dominated by prompt losses. DOE

N85-29741# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.

MODELING AND EXPERIMENTS ON TRITIUM PERMEATION IN FUSION REACTOR BLANKETS
D. F. Holland and G. R. Longhurst 1985 8 p refs Presented at the 2nd Natl. Topical Meeting on Tritium Technol. in Fission, Fusion, and Isotopic Appl., Dayton, Ohio, 30 Apr. 1985
(Contract DE-AC07-76ID-01570)
(DE85-008439; EGG-M-20884; CONF-850405-6) Avail: NTIS HC A02/MF A01

The determination of tritium loss from helium-cooled fusion breeding blankets are discussed. The issues are: (1) applicability of present models to permeation at low tritium pressures; (2) effectiveness of oxide layers in reducing permeation; (3) effectiveness of hydrogen addition as a means to lower tritium permeation; and (4) effectiveness of conversion to tritiated water and subsequent trapping to reduce permeation. Theoretical models applicable to these issues are discussed, and results of experiments in two areas are presented; permeation of mixtures of hydrogen isotopes and conversion to tritiated water. DOE

N85-29742# Rome Univ. (Italy). Dipt. di Fisica.
EARLY STUDY OF MUONS AND MUON DECAY
M. Conversi 16 Oct. 1984 16 p refs Presented at Intermediate Vector Boson Intern. Conf. on 50 Years of Weak Interactions: From the Fermi Theory to the W, Racine, Wis., 29 May - 1 Jun. 1984
(NOTA-INTERNA-835) Avail: NTIS HC A02/MF A01

Work on secondary cosmic radiation carried out over the period 1929-1947 is reviewed including the experimental demonstration that penetrating cosmic rays are unstable particles of intermediate mass (mesotrons), for a long time incorrectly identified with the Yukawa mediator of nuclear forces. Investigations of mesotrons at rest in nuclear matter, which led to the discovery of a second charged lepton (the muon) and to the concept of a universal Fermi interaction are described. The discovery of the first strong interacting meson, the charged pion is recalled.
Author (ESA)

N85-29743# Rome Univ. (Italy). Dipt. di Fisica.
TOPICS IN INTERMEDIATE VECTOR BOSON PHYSICS
Luciano Maiani 16 Jan. 1985 82 p refs Presented at Theoret. Advan. Study Inst. Lectures, Ann Arbor, Mich., Jun. 1984
(NOTA-INTERNA-841) Avail: NTIS HC A04/MF A01

The standard lagrangian model used in intermediate vector boson physics; decay and production of intermediate vector bosons; supersymmetric decay modes; anomalous magnetic moments and muon-quark universality; logarithmic approximation and exact one-loop corrections; precise prediction of vector boson parameters; and the effects of doublets with large splitting, heavy degenerate multiplets, and susy effects are discussed.
Author (ESA)

N85-29744# Rome Univ. (Italy). Dipt. di Fisica.
ON THE DEFINITION OF TOPOLOGICAL SUSCEPTIBILITY VIA LATTICE ANOMALOUS WARD IDENTITIES AND ITS PERTURBATIVE TAIL
M. Bochicchio 18 Sep. 1984 36 p refs
(PREPRINT-416) Avail: NTIS HC A03/MF A01

The lattice definition of topological charge density suggested by the U(1)A anomalous Ward identity is considered. It is proved that the associated topological susceptibility has no perturbative tail in the chiral limit (zero renormalized quark mass) by studying the infrared properties of perturbative lattice QCD. Author (ESA)

N85-29745# Rome Univ. (Italy). Dipt. di Fisica.
EXCITED LEPTONS CONTRIBUTION TO MUON g-2
Filippo Cesi 15 Jan. 1985 26 p refs
(PREPRINT-432) Avail: NTIS HC A03/MF A01

The contribution to the muon anomalous magnetic moment due to the presence of spin 1/2 excited leptons is computed. The model is an extension of the electroweak standard theory with the excited leptons coupled in an SU(2)xU(1) invariant way. The results are discussed in connection with the hypothesis that the existence of these particles explains the anomalous Z decays into a hard photon and a lepton pair. Author (ESA)

N85-29746# National Inst. voor Kernfysica en Hoge Energieysica, Amsterdam (Netherlands).
SAFETY REPORT, 1982 [VEILIGHEIDSVERSLAG 1982]
Dec. 1983 20 p In DUTCH
Avail: NTIS HC A02/MF A01

Measurement results of the dosimeter network around a 30 kW particle accelerator show an insignificant 1% enhancement of the natural zero effect. Author (ESA)

N85-29747# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Extraterrestrische Physik.
CARBON FOIL SECONDARY ELECTRON EMISSION DURING ION PASSAGE THROUGH THE 40 TO 500 keV ENERGY FIELD [SEKUNDAERELEKTRONENEMISSION VON KOHLENSTOFFOLIEN BEIM DURCHGANG VON IONEN IM ENERGIEBEREICH VON 40 BIS 500 KEV]
Hartmut Christian Ritter Feb. 1985 88 p refs In GERMAN
(MPE-190; ISSN-0340-8922) Avail: NTIS HC A05/MF A01

Carbon foil secondary electron emission during ion passage through the 40 to 500 keV energy field was measured for absolute calibration of the Suprathermal Energy Ionic Charge Analyzer (SULEICA) consisting of an electronic analyzer combined with a time of flight spectrometer. The SULEICA is developed for the Active Magnetospheric Particle Tracer Experiment mission on the Ion Release Module satellite to investigate ion acceleration, transport and storage in the magnetosphere. The test equipment consists of two microchannel plates and of accelerated electrons in a semiconductor particle counter allowing comparison of the equipment impulse spectra and measurement of the emitted electrons for each ion (barium and lithium ions). The secondary electron emission depends on the projectile type and energy. The difference measured in the secondary electron emission is explained by the foil thickness and the emission direction.
Author (ESA)

N85-29748# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Werner-Heisenberg Inst. fuer Physik.
[ACTIVITIES REPORT OF THE WERNER-HEISENBERG INSTITUTE FOR PHYSICS] Annual Report, 1984 [JAHRESBERICHT 1984]
Jan. 1985 176 p refs In GERMAN Original contains color illustrations
(ISSN-0173-6256) Avail: NTIS HC A09/MF A01

Research into the elementary particle acceleration; elementary particle interactions; charmed particles; radiation detectors; quantum theory; gauge theory; and the contribution of elementary particle physics to cosmology is summarized. Author (ESA)

74 OPTICS

Includes light phenomena.

N85-29749* National Aeronautics and Space Administration. Pasadena Office, Calif.
OPTICAL FIBER COUPLING METHOD AND APPARATUS Patent
Willis C. Goss (JPL, Pasadena, Calif.), Mark D. Nelson (JPL, Pasadena, Calif.), and John M. McLauchlan, inventors (to NASA) (JPL, Pasadena, Calif.) 18 Jun. 1985 8 p Filed 26 Jan. 1982 Sponsored by NASA
(NASA-Case-NPO-15464-1; US-Patent-4,523,810;
US-Patent-Appl-SN-342828; US-Patent-Class-350-320;
US-Patent-Class-156-166; US-Patent-Class-350-96.15) Avail: US Patent and Trademark Office CSCL 20F

Systems are described for coupling a pair of optical fibers to pass light between them, which enables a coupler to be easily made, and with simple equipment, while closely controlling the characteristics of the coupler. One method includes mounting a pair of optical fibers on a block having a large hole therein, so

the fibers extend across the hole while lying adjacent and parallel to one another. The fibers are immersed in an etchant to reduce the thickness of cladding around the fiber core. The fibers are joined together by applying a liquid polymer so the polymer-air interface moves along the length of the fibers to bring the fibers together in a zipper-like manner, and to progressively lay a thin coating of the polymer on the fibers.
Official Gazette of the U.S. Patent and Trademark Office

N85-29750* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
LIGHT TRANSMITTING WINDOW ASSEMBLY Patent
Dale L. Connelly, inventor (to NASA) Issued 4 Jun. 1985 5 p Filed 16 Aug. 1983 Sponsored by NASA
(NASA-Case-MSC-18417-1; US-Patent-4,521,077; US-Patent-Appl-SN-523559; US-Patent-Class-350-319; US-Patent-Class-350-312; US-Patent-Class-350-321; US-Patent-Class-52-171) Avail: US Patent and Trademark Office CSCL 20F

This invention provides a light transmitting assembly that can, at will, be changed from a state of transparency to one of translucency. It comprises two parallel spaced apart panes of transparent material, such as glass, with a film of polytetrafluoroethane, which is inherently translucent or opaque, disposed between. The assembly is rendered transparent by introducing a fluid into the assembly to substantially cover a surface of the film; the liquid having a refractive index corresponding to the refractive index of the film. The translucency is restored by removing the fluid. Official Gazette of the U.S. Patent and Trademark Office

N85-29751 Department of the Air Force, Washington, D.C.
SELF-DETECTING OPTICAL SENSORS Patent
R. Zuleeg and J. K. Notthoff, inventors (to Air Force) Issued 19 Mar. 1985 9 p Supersedes AD-D009767
(AD-D011657; US-Patent-4,505,582; US-Patent-Appl-SN-398134; US-Patent-Class-365-5) Avail: US Patent and Trademark Office CSCL 20/5

A short-ranging laser system having an improved pulser which includes a drive pulse signal generator and a driver. The drive pulse signal generator is essentially a triggered bipolar avalanche transistor that outputs a drive pulse signal through a voltage shifting circuit to the driver. The driver is essentially two parallel-connected power MOSFETs that output a driver pulse to a GaAs heterojunction laser diode. By circuit design, the deadtime plateau is substantially reduced so that the laser returns energy homodynes with the still active laser to produce a detectable output for a target within 5 meters. Author (GRA)

N85-29752# Department of the Air Force, Washington, D.C.
TECHNIQUE TO REDUCE SCATTERED LIGHT IN OPTICAL SYSTEMS Patent Application
M. P. Wirick, inventor (to Air Force) Filed 10 Jan. 1985 15 p
(AD-D011597; US-Patent-Appl-SN-690541) Avail: NTIS HC A02/MF A01 CSCL 20/6

In this patent application, in order to reduce the amount of internally scattered radiant energy in an optical system having a collecting optical chamber and a secondary optical chamber, a moving aperture device is positioned in a first focal plane between the chambers; the aperture device has a continuous moving metal band that has staggered slits therein. The band is sprocket driven and cryogenically cooled to reduce thermal emission. The band can be synced with other scanning detectors in the optical system such as one might find in an infrared telescope used in outer space. GRA

N85-29753# California Univ., Irvine. Dept. of Physics.
THEORETICAL INVESTIGATIONS OF THE PROPAGATION AND INTERACTIONS OF SURFACE WAVES Final Report, 16 Nov. 1981 - 15 Nov. 1984
A. A. Maradudin 22 Feb. 1985 5 p
(Contract DAAG29-82-K-0018)
(AD-A153548; ARO-18493.14-PH) Avail: NTIS HC A02/MF A01 CSCL 20/6

A research program is proposed for theoretical studies of the propagation and interaction of surface waves. Two types of surface waves will be investigated: surface acoustic waves and surface electromagnetic wave (surface polaritons). The former have important application in devices such as signal processors and the latter in integrated optics. For both types of surface waves theoretical investigation will be made of the reflection and transmission of surface waves at a planar boundary between two material media. GRA

N85-29754# Materials Research Labs., Ascot Vale (Australia).
HIGH-PRESSURE OPTICAL CELL
R. McLeary and A. J. Hutchins Nov. 1984 15 p
(AD-A153639; MRL-TN-486) Avail: NTIS HC A02/MF A01 CSCL 20/6

This technical note describes a high-pressure optical cell and associated pressurizing equipment which have been constructed at MRL. The system provides gas mixtures in the cell at pressures of up to 200 MPa at temperatures in the range 200-300 K. The apparatus was required for an experimental investigation of collision-induced fluorescence and optical gain in optically-pumped gas mixtures at high pressure. GRA

N85-29755# Idaho National Engineering Lab., Idaho Falls. Diagnostic Measurements Branch.
FIBER OPTICS IN HIGH DOSE RADIATION FIELDS
Judy K. Partin 1985 14 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract DE-AC07-76ID-01570)
(DE85-008649; EGG-M-22584; CONF-850345) Avail: NTIS HC A02/MF A01

A review of the behavior of state-of-the-art optical fiber waveguides in high dose (greater than or equal to 10 to the 5th rad), steady state radiation fields is presented. The influence on radiation-induced transmission loss due to experimental parameters such as dose rate, total dose, irradiation history, temperature, wavelength, and light intensity, for future work in high dose environments are given. DOE

N85-29756# Brookhaven National Lab., Upton, N. Y. National Synchrotron Light Source.
THIN LAYERED INTERFERENCE MIRRORS TO REDUCE RADIATION DAMAGE
Paul L. Csonka 1985 5 p refs Presented at the 2nd Intern. Workshop on Laser Acceleration of Particles, Los Angeles, 7-17 Jan. 1985
(Contract DE-AC02-76CH-00016)
(DE85-009763; BNL-36091; CONF-850128-9) Avail: NTIS HC A02/MF A01

Damage induced by radiation of wavelength lambda, incident on mirrors (and other optical elements) can be significantly reduced by a multilayered construction, in which the layers most sensitive to radiation damage have thicknesses less than lambda. The layers may or may not be free standing. The threshold to radiation damage is calculated to increase by a factor approx. = 10 sup 2. DOE

N85-29757# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Avionics Panel.
DIGITAL OPTICAL CIRCUIT TECHNOLOGY
Billy L. Dove, ed. (NASA. Langley Research Center) Loughton, England Mar. 1985 222 p refs Symp. held in Schliersee, West Germany, 11-12 Sep. 1984
(AGARD-CP-362; ISBN-92-835-1485-8) Avail: NTIS HC A10/MF A01

The Proceedings for the 48th Meeting of the AGARD Avionics Panel contain the 18 papers presented a Technical Evaluation Report, and discussions that followed the presentations of papers. Seven papers were presented in the session devoted to optical bistability. Optical logic was addressed by three papers. The session on sources, modulators and demodulators presented three papers. Five papers were given in the final session on all optical systems. The purpose of this Specialists' Meeting was to present the research and development status of digital optical circuit technology

and to examine its relevance in the broad context of digital processing, communication, radar, avionics and flight control systems implementation. For individual titles, see N85-29758 through N85-29775.

N85-29758# Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
OPTICALLY BISTABLE DEVICES USING InSb
S. D. Smith, F. A. P. Tooley, A. K. Walker, J. G. H. Kar, and B. S. Wherrett *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 9 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

InSb etalons operated at 77 K and illuminated by CO lasers (5.5 micrometers) exhibit CW optical bistability. A wide range of experiments were performed to permit the basic characterization of these devices and to demonstrate their various potential applications. The latter include signal amplification, modulation and, with external switching, the construction of logic gates. Two devices on a single etalon have now been coupled to form a simple all-optical circuit. New results were also obtained with InSb at room temperature using pulsed CO2 lasers (10.6 micrometers). Author

N85-29759# Johann-Wolfgang-Goethe-Univ., Frankfurt am Main (West Germany). Physikalisches Inst.
OPTICALLY NONLINEAR AND BISTABLE BEHAVIOUR OF DIRECT GAP SEMICONDUCTORS **c76**
C. Klingshirn, K. Bohnert, H. Kalt, and K. Kempf (LITEF) *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 14 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

The optical properties of semiconductors, i.e., the spectra of absorption and refraction are determined in the vicinity of the absorption edge by exciton states. At low light intensities, the optical properties of a sample are independent of the incident light power. This is the regime of linear optics. Under illumination with strong light fields, generally from lasers, the optical properties become intensity dependent. These so called nonlinear optical phenomena can be detected by various experimental techniques like laser induced grating spectroscopy or excite and probe beam techniques. From the experimental data, the physical origin of the nonlinearities may be deduced. The most important contributions are with increasing excitation a broadening of the exciton resonances, transitions to the biexciton and finally the phase transition to an electron-hole plasma. Some of these excitation induced variations of the optical properties can be used to achieve optical bistability. Various types of absorptive and dispersive bistability were found. These optically bistable devices promise interesting possibilities for application as digital memories or as elements for logical operations. Author

N85-29760# Royal Signals and Radar Establishment, Malvern (England).
OPTICAL BISTABILITY IN Cd(x)Hg(1-x)Te **c76**
A. Miller, D. Craig, G. Parry (Univ. College, London), J. G. H. Mathew, and A. K. Kar *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 11 p refs Prepared in cooperation with Heriot-Watt Univ., Edinburgh (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

The origin and characteristics of nonlinear effects in CdHgTe Fabry-Perot etalons at 10.6 micrometers which arise from large intensity dependent refractive index changes are discussed. Optical switching and bistability were observed in room temperature samples by two photon excitation. The band gap dependencies of these phenomena are analyzed. Author

N85-29761# Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Physics.
OPTICAL MODULATORS AND BISTABLE DEVICES USING MOLECULAR GASES
R. G. Harrison, W. J. Firth, I. A. Al-Saidi, and E. Cummins *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 8 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

That so-called bistable nonlinear Fabry-Perot resonators can actually exhibit a rich variety of instabilities is predicted; in particular the resonator can convert a steady input field into an oscillatory or even chaotic output field. Oscillation itself leads to a passive all optical laser modulator device tunable in frequency in the range of approximately 1 GHz with anticipated applications in opto-electronics and telecommunications. The unique advantages of molecular gases as nonlinear media in these systems was utilized in successfully demonstrating these effects using pulsed CO2 laser radiation, the results of which are in excellent accord with theory, analysis also showing that prospects for CW operation are promising. Author

N85-29762# Plessey Research (Caswell) Ltd., Towcester (England). Allen Clark Research Centre.
AN EXPERIMENTAL NONLINEAR OPTICAL WAVEGUIDE DEVICE
I. Bennion, M. J. Goodwin, D. J. Robbins, and J. Stewart *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 9 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

An experimental nonlinear optical waveguide device is described which comprises a glass optical waveguide surmounted by CS2. Intensity-dependent hysteresis in the power guided by the structure was observed which is related to the intensity-dependent refractive index of the overlayer. The surface of a planar optical waveguide is contacted to a nonlinear medium to produce a nonlinear interface in a simple waveguide format. It is anticipated that a waveguide configuration, being compact and capable of achieving the high optical intensities required for nonlinear optics from a source of relatively modest power output, might form the basis for a device employing this effect. The waveguide nonlinear interface using a plane wave approach similar to that employed by Kaplan for the bulk case was analyzed. The analysis shows that for the TE modes of the waveguide a straight-forward generalization of linear slab waveguide theory leads to modes parameterized by the power flow in the waveguide in the nonlinear case. The plane wave theory of the waveguide device is summarized, and the experimental results are described. E.R.

N85-29763# Army Missile Lab., Redstone Arsenal, Ala.
STATIONARY PROPERTIES AND SWITCHING CHARACTERISTICS OF DISPERSIVE OPTICAL BISTABILITY IN CuCl
C. M. Bowden, J. W. Haus (National Research Council), and C. C. Sung *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 10 p refs Prepared in cooperation with Alabama Univ., Huntsville (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

The stationary properties are presented for optical bistability (OB0 from a semiclassical excition-biexciton model for CucL in the limit of large Fresnel number. Numerical solutions using the second-order Maxwell's equation (EX) are compared with corresponding solutions where the slowly varying envelope approximation (SVEA) has been made. In addition, the Ex and SVEA results are compared with the corresponding mean-field results (MFA). It is found that results obtained using the SVEA are in close quantitative agreement with those using the second-order Maxwell's equation (EX results), whereas the MFA results are in qualitative agreement only. On the basis of the close quantitative agreement between the SVEA and EX results, we use the SVEA hierarchy of equations to numerically compute dynamics of switching as the input field is varied. The calculation is done without adiabatic elimination, which is not valid for OB in CuCL. Our main conclusions are that the OB in CuCL in steady state can be characterized very closely as a Kerr type nonlinearity and that the switch-down time is approximately equal to the switch-up time which is close to 80 psec at the laser photon energy 3177 mev. The switching time correlates with the polariton lifetime in the material and this has significant consequences for the switching characteristics in dispersive media. Author

N85-29764# Army Missile Lab., Redstone Arsenal, Ala.
CAVITYLESS OPTICAL BISTABILITY IN SYSTEMS OF TWO-LEVEL ATOMS
C. M. Bowden and F. A. Hopf *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 8 p refs Prepared in cooperation with Arizona Univ., Tucson (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

The local field correction (LFC) is used to eliminate the local field in the macroscopic semiclassical density matrix for a collection of homogeneously broadened, two level atoms interacting with the radiation field, which is described by Maxwell's equation. The system of equations is solved in steady state with the boundary conditions for a plane wave normally incident on the dense absorbing medium of propagation length much less than a resonance wavelength. Optical bistability (OB) is predicted, based upon adiabatic or steady state conditions. As a test of the validity of the predictions, results are reported using a semiclassical heuristic microscopic model with fluctuations for a collection of a finite number of electric field driven, two level atoms. In this case no LFC is needed and none is made; however, OB is observed consistent with the predictions from the steady state macroscopic model. Author

N85-29765# Arizona Univ., Tucson. Optical Sciences Center.
PROSPECTS FOR PARALLEL NONLINEAR OPTICAL SIGNAL PROCESSING USING GaAs ETALONS AND ZnS INTERFERENCE FILTERS
H. M. Gibbs, J. L. Jewell (Bell Telephone Labs., Inc., Holmdel, N.J.), Y. H. Lee, A. Macleod, G. Olbright, S. Ovadia, N. Peyghambarian, M. C. Rushford, M. Warren, D. A. Weinberger et al *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 5 p refs Prepared in cooperation with Bell Telephone Labs., Inc., Murray Hill, N.J. (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

Micron thick semiconductor etalons perform logic operations using input beams of a few mW. Problems associated with the parallel operation of thousands of etalons are discussed. GaAs and ZnS appear to be the most attractive materials for low power room temperature operation. GaAs etalons and ZnS interference filters are both attractive for multiple beam nonlinear optical signal processing. Clearly it is highly desirable to reduce the switching power and heat generated in each pixel. Meanwhile the present values are low enough to pursue the other problems of generating multiple beams and developing useful architectures. Author

N85-29766# Heriot-Watt Univ., Edinburgh (Scotland).
ALL-OPTICAL LOGIC GATES WITH EXTERNAL SWITCHING BY LASER AND INCOHERENT RADIATION
S. D. Smith, F. A. P. Tooley, A. C. Walker, J. G. H. Mathew, M. Taghizadeh, and B. S. Wherrett *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 8 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

Nonlinear Fabry-Perot etalons, with bistable or stepped characteristic, were shown to act as logic gates and hence provide a basis for all-optical digital computing. Experimental studies have demonstrated coupling of these gates, a range of external switching possibilities and both infrared and visible wavelength operation. These successfully show at the simplest level, the feasibility of this concept. The infrared carrier wavelength and processing system could readily utilize an array of 1,000 elements in 1 sq. cm of InSb which, switching in approximately 100 ns, implies a data rate of 10 to the 11th power bits/sec. A total input power of the order 1 W would not all be dissipated in the device. In practice other operating wavelengths, and hence materials, will be necessary to ensure full exploitation of these techniques. With the rapidly expanding data communication rates permitted by fiber-optic networks the advantages of using wide band all-optical processing techniques in the link interfaces could be considerable. Similarly, all-optical processing of visual information could prove extremely efficient in, for example, robotics applications. Author

N85-29767# Thomson-CSF, Orsay (France). Lab. Central de Recherches.
INTEGRATED ELECTROOPTICAL COMPONENTS USING DIELECTRIC SUBSTRATES
M. Papuchon, Y. Bourbin, S. Vatoux, and C. Puech *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 8 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

After a brief review on the different configurations which have been used to obtain modulators and switches, recent progress is discussed. In addition, the use of these electrooptical devices in optoelectronic feed back loops is described. In particular experiments using interferometric modulators showed the interesting properties of such configurations for optical comparison, linearization of the response of the modulator and different amplification. Remote control of an electrooptical directional coupler is also described. Then the use of an optical comparator in a channel of an A/D electrooptical converter is presented. R.J.F.

N85-29768# British Telecom International (England). Research Labs.
THE POTENTIAL OF SEMICONDUCTORS FOR OPTICAL INTEGRATED CIRCUITS c76
S. Ritchie and A. G. Steventon *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 20 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

Optical circuits made with semiconductors should eventually have considerable performance, reliability and cost benefits over similar components made with many alternative materials, because of the ability to integrate waveguide devices with optical sources, detectors and electronic circuitry. Although, at present, the performance of semiconductor waveguide devices is inferior to that of devices made with lithium niobate, progress is rapid and there seem no fundamental reasons why semiconductor devices should not eventually give performance comparable with many non-semiconductor devices. A wide range of semiconductor optical and electronic devices will be available for integration in semiconductor optical integrated circuits, but considerable technological developments are needed - especially in epitaxial growth. Author

N85-29769# Cambridge Univ. (England). Engineering Dept.
MULTIPORT OPTICAL DETECTORS
N. G. Walker and J. E. Carroll *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 13 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

At microwave frequencies the application of multiport junctions to making phase and amplitude measurements is well established. In this technique unknown signals are combined in a multiport to give a number of output signals. Monitoring the power at each output port then enables the required signal information to be deduced. Here the equivalent optical measurements made when a number of light beams are mixed in a lossless junction and then detected using photoemissive devices is investigated. This is called optical multiport detection by analogy with the microwave theory. Applications of some optical multiports to various phase and amplitude measurement problems are discussed. The quantum theory multiport detection is introduced, and the quantum operator corresponding to the complex amplitude measurement made by a particular multiport is presented. It is not known how to realize practically a measurement of the quantum maximum likelihood phase estimator, however the performance of the multiport operator in measuring phase comes within seventy percent of this limit. R.J.F.

N85-29770# Standard Elektrik Lorenz A.G., Stuttgart (West Germany). Research Center.
PICOSECOND PHOTOCONDUCTIVE DEVICES FOR < 10 Gbit/s OPTOELECTRONIC SWITCHING c33
G. Veith *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 14 p refs Sponsored by Max-Planck-Gesellschaft, Deutsche Forschungsgemeinschaft, and Technische Univ. Wien (For primary

document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

Semiconductor materials with a high density of recombination and trapping centers exhibit extremely short carrier lifetimes in the order of 1 to 100 ps and have been the base for the development of high speed optoelectronic switches. These devices are activated by picosecond laser pulses and can be driven nearly free of jitter with respect to the optical excitation pulses. They show some unique properties as picosecond risetimes and response times and can be operated within a relatively high dynamical range (10-5 to 10 sub 4 V) (0.00001 to 0.0001 V). A review is given on the wide field of possible applications of the ultrafast photoconductive switches. They can be used as photodetectors for picosecond light pulses as well as sampling gates for the characterization of high speed electronic and optoelectronic devices. In some experiments which are discussed more in detail the author demonstrates the capability of this type of photoconductive switches for the generation of picosecond infrared pulse trains in laser diodes and for the generation of high-bit rate electrical codes for use in Gbit/s optical communication and sensing systems, for logical switching and for testing purposes of high speed electronic instrumentations. R.J.F.

N85-29771# Erlangen-Nuremberg Univ. (West Germany). Physikalisches Inst.
THE PROSPECTS OF THE DIGITAL OPTICAL COMPUTER
H. Bartelt, A. W. Lohmann, and J. Weigelt *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 5 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

The suitability of electrons and photons for the purpose of computing is assessed. Based on these fundamental features it is pointed out why photons are in some ways better suited for parallel processors. Parallel processors are needed to satisfy the ever-increasing demand for speed of computation. The status of digital optical computing experiments is surveyed. It is concluded that electrons are well suited for switching operations as they occur in a logic processor. But electrons are not so easy to guide from one point to another point. On that score, photons are more suitable. Recently, photons became amenable also for logic processing. Hence, the stage is set for the development of an all-optical digital computer. A digital optical computer has as its assests: parallel processing; global interconnections, that are favorable for architecture and algorithms. But the digital optical computer is a late-comer. Nevertheless, the optical computer has a chance to supplement the electronic computer as a special purpose parallel processor. R.J.F.

N85-29772# Texas Instruments, Inc., Dallas. Central Research Lab.
DEFORMABLE MIRROR NEAREST NEIGHBOR OPTICAL COMPUTER
A. D. McAulay *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 9 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

A relatively simple optical computer is described which is capable of performing one billion operations per second with 32 bit data for nearest neighbor computations. It assumes the availability of deformable mirror devices having 1000 by 1000 elements which can be set in 8 mseconds. A simple system with two deformable mirror devices, one charge coupled device, and some simple electronics, operates at 15.6 million operations per second. Higher performance is achieved by duplicating this equipment because the nearest neighbor and residue number concepts permit perfect parallel efficiencies. The matrix operations dominate the computation because overlapping of other operations is possible by algorithm modification. R.J.F.

N85-29773# University Coll., London (England). Microwave Research Unit.
OPTICAL TECHNIQUES FOR SIGNAL DISTRIBUTION AND CONTROL IN ADVANCED RADAR AND COMMUNICATION SYSTEMS **c32**
J. R. Forrest *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 14 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

It is concluded that optical techniques offer some advantages for signal distribution and control in advanced radar and communication systems. They are clearly ideal for transporting microwave signals over considerable distances, as in remote positioning of radar receivers, provided high dynamic range is not required and an enclosed transmission path is essential. They are an elegant means of distributing low level r.f. or i.f. signals around an active phased array where these signals are of relatively constant amplitude (as in mixer local oscillator applications). However, there is currently a rather restrictive limit on the size of distribution network possible. Optical techniques are obviously suitable for distributing digital control signals to phased array modules and confer considerable immunity to interference. They are less suitable for high dynamic range signals, such as the received radar returns, either at r.f. or when downcovered to i.f. Future developments in coherent optics or in fast optical A/D technology could, however, influence this conclusion. Currently, the optimum applications for optical techniques appear to be i.f. beamformers for multibeam communication satellite systems and in calibration/monitoring systems for phased arrays. R.J.F.

N85-29774# Defense Advanced Research Projects Agency, Arlington, Va. Electronic Sciences Div.
ELECTRO-OPTIC TECHNIQUES FOR VLSI INTERCONNECT
John A. Neff *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 7 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

A major limitation to achieving significant speed increases in very large scale integration (VLSI) lies in the metallic interconnects. They are costly not only from the charge transport standpoint but also from capacitive loading effects. The Defense Advanced Research Projects Agency, in pursuit of the fifth generation supercomputer, is investigating alternatives to the VLSI metallic interconnects, especially the use of optical techniques to transport the information either inter or intrachip. As the on chip performance of VLSI continues to improve via the scale down of the logic elements, the problems associated with transferring data off and onto the chip become more severe. The use of optical carriers to transfer the information within the computer is very appealing from several viewpoints. Besides the potential for gigabit propagation rates, the conversion from electronics to optics conveniently provides a decoupling of the various circuits from one another. Significant gains will also be realized in reducing cross talk between the metallic routings, and the interconnects need no longer be constrained to the plane of a thin film on the VLSI chip. In addition, optics can offer an increased programming flexibility for restructuring the interconnect network. Author

N85-29775# Ohio State Univ., Columbus. ElectroScience Lab.
NUMERICAL OPTICAL COMPUTING AT THE OHIO STATE UNIVERSITY
S. A. Collins, Jr., S. F. Habiby, and A. F. Zwilling *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 19 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

Designs for various devices intended to perform numerical operations using a Hughes liquid crystal light valve and the residue arithmetic representation are considered. A numerical optical temporal integrator, intended to take as input a string of numbers and keep a running sum is presented, as is an optical clock designed to generate optical timing pulses using a liquid crystal light valve. A comparison of binary and residue arithmetic in one application is given. A discussion of a numerical optical matrix multiplier is given. A sketch of the design is shown and the information layout on the light valve and input planes is described. R.J.F.

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N85-29776# Naval Research Lab., Washington, D. C.
PROJECTIONS OF PLASMA CLOUD STRUCTURES AND THEIR SPECTRA Memorandum Report, Oct. 1983 - Oct. 1984
N. J. Zabusky, E. Hyman, and M. Mulbrandon 22 Apr. 1985 30 p
(NR Proj. S99-QMXR)
(AD-A153608; NRL-MR-5561) Avail: NTIS HC A03/MF A01 CSCL 20/9

We have established a relationship between the asymptotic spectral index of idealized piecewise-constant optically-thin radiating sources and their scans. For piecewise-constant clouds, where the one-dimensional asymptotic spectrum of the power is proportional to 1/k squared, we have shown that the asymptotic spectrum of the scan depends upon the character of the contour. We also apply the results to the interpretation of optical scans from two PLACES events. These are insufficiently resolved and their estimated spectral index of 2.5 is associated with a composite of effects and not the nonlinear dynamics of striation evolution. GRA

N85-29777# Naval Postgraduate School, Monterey, Calif.
DESIGN CONSIDERATION FOR THE X-RAY CERENKOV EXPERIMENT M.S. Thesis
Y. D. Choi Dec. 1984 50 p
(AD-A153636) Avail: NTIS HC A03/MF A01 CSCL 20/9

The feasibility of measuring Cerenkov radiation in the X-ray region was investigated. It is found that the experimental measurement of X-ray Cerenkov radiation is possible for the carbon K (283.84 eV), aluminum L1 (87.01 eV) and L2,3 (72.78 eV) absorption edges. Measurement in the aluminum K (1559.9 eV) absorption edge region was found to be not possible since the real part of the index of refraction did not exceed unity. The relative power from Cerenkov radiation was calculated for the three possible cases and count rate estimates were given. The experimental apparatus for the measurement of X-ray Cerenkov radiation was redesigned to allow measurement of the carbon K edge and aluminum L1 edge. An experiment was attempted, but not completed due to the failure of a necessary preamplifier for a proportional counter. New design considerations were presented and incorporated changes to avoid the experimental shortcomings of previous measurements. GRA

N85-29778# Science Applications, Inc., La Jolla, Calif.
REVERSED FIELD PINCH DYNAMICS AND TRANSPORT STUDIES Final Report, Apr. 1984 - Apr. 1984
7 Dec. 1984 132 p refs
(Contract DE-AC03-83ER-53150)
(DE85-007553; DOE/ER-53150/T4) Avail: NTIS HC A07/MF A01

The fundamental magnetohydrodynamic (MHD) processes that occur in the reverse field pinch (RFP) were identified. These processes were correlated with experimental observations, and an assessment of their effect on transport and confinement has begun. The conditions necessary for dynamo action are outlined. Specific accomplishments include: (1) the three-dimensional, compressible MHD code SPECTR3 and its associated post processors were developed and brought into production; (2) SPECTR3 was used to identify, for the first-time, the fundamental nonlinear MHD processes that occur in the RFP; (3) a model explaining many of the experimental observations on ZT-40M was given; (4) a three-dimensional incompressible MHD code INCOMPR was written and debugged; (5) a reduced computational model for the study of low-frequency current drive in the RFP was developed; (6) analytic studies of the helical dynamo in the RFP yielded necessary conditions, under certain circumstances, for the existence of the dynamo; and (7) statistical studies of the stochastic regions appearing in the numerical simulations produced an upper limit on the degree of stochasticity to be expected in the RFP, and its potential impact on transport. DOE

N85-29779# Oak Ridge National Lab., Tenn. Fusion Energy Div.
ELECTRON TEMPERATURE MEASUREMENTS FROM INDUCED TOROIDAL CURRENT IN ELMO BUMPY TORUS SCALE
T. Uckan Mar. 1985 26 p refs
(Contract DE-AC05-84OR-21400)
(DE85-008549; ORNL/TM-9315) Avail: NTIS HC A03/MF A01

Measurements on ELMO Bumpy Torus-Scale (EBT-S) were carried out to estimate the electron temperature of the toroidal plasma inducing a small (approx. 2-A) fluctuating (5-Hz) ac toroidal current. The modulating frequency used is low enought to minimize the effects of cavity skin time (approx. 100 ms) and plasma inductance. The temperature was calculated from the measured values of the current obtained by use of the Rogowsky loop at various fill pressures at 100 kW with 28-GHz operation. The electron temperature has been estimated to be around 80 top 90 eV with an error of about 10 to 25% in the low T-mode, which is in good agreement with the Thomson scattering measurements. DOE

N85-29780# Los Alamos Scientific Lab., N. Mex.
RECENT PROGRESS IN STELLARATOR REACTOR CONCEPTUAL DESIGN
Ronald L. Miller 1985 10 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contract W-7405-eng-36)
(DE85-009592; LA-UR-85-753; CONF-850310-45) Avail: NTIS HC A02/MF A01

The Stellarator/Torsatron/Heliotron (S/T/H) class of toroidal magnetic fusion reactor designs continues to offer a distinct and in several ways superior approach to eventual commercial competitiveness. Although no major, integrated conceptual reactor design activity is presently underway, a number of international research efforts suggest avenues for the substantial improvement of the S/T/H reactor embodiment, which derive from recent experimental and theoretical progress and are responsive to current trends in fusion-reactor projection to set the stage for a third generation of designs. Recent S/T/H reactor design activity is reviewed and the impact of the changing technical and programmatic context on the direction of future S/T/H reactor design studies is outlined. DOE

N85-29781# Los Alamos Scientific Lab., N. Mex.
COMPARISON STUDY OF TOROIDAL-FIELD DIVERTORS FOR A COMPACT REVERSED-FIELD PINCH REACTOR
C. G. Bathke, R. A. Krakowski, and R. L. Miller 1985 7 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985
(Contract W-7405-eng-36)
(DE85-009591; LA-UR-85-752; CONF-850310-44) Avail: NTIS HC A02/MF A01

Two divertor configurations for the Compact Reversed-Field Pinch Reactor (CRFPR) based on diverting the minority (toroidal) field have been reported. A critical factor in evaluating the performance of both poloidally symmetric and bundle divertor configurations is the accurate determination of the divertor connection length and the monitoring of magnetic islands introduced by the divertors, the latter being a three-dimensional effect. To this end the poloidal-field, toroidal-field, and divertor coils and the plasma currents are simulated in three dimensions for field-line trackings in both the divertor channel and the plasma-edge regions. The results of this analysis indicate a clear preference for the poloidally symmetric toroidal-field divertor. Design modifications to the limiter-based CRFPR design that accommodate this divertor are presented. DOE

N85-29782# Argonne National Lab., Ill.
LOW PLASMA EDGE TEMPERATURES FOR THE SELF-PUMPED LIMITER
W. K. Terry (Purdue Univ.) and J. N. Brooks Mar. 1985 23 p

refs
(Contract W-31-109-eng-38)
(DE85-010155; ANL/FPP-TM-201) Avail: NTIS HC A02/MF A01

Transport code calculations were performed to study the operation of an INTOR like Tokamak plasma from which helium is removed by a self pumped limiter, which traps helium, but not hydrogen, in its surface layers. To prevent saturation by helium, the surface is renewed by continuous injection of the surface material (vanadium in this study) into the scrape off layer. The presence of the injected vanadium leads to plasma temperatures well below 50 eV in the scrape off layer, with supplementary RF heating. Operation in this edge temperature regime is essential for the use of medium and high-Z limiter coatings. DOE

N85-29783# Argonne National Lab., Ill.
SELF-SUSTAINING COATINGS FOR FUSION APPLICATIONS: COPPER LITHIUM ALLOYS
A. R. Krauss, D. M. Gruen, J. N. Brooks, M. H. Mendelsohn, R. F. Mattas, and A. B. DeWald (Georgia Inst. of Tech.) 1985 6 p refs Presented at 6th Topical Meeting of the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contract W-31-109-eng-38)
(DE85-009740; CONF-850310-46) Avail: NTIS HC A02/MF A01

Auger electron spectroscopy was used to monitor the surface composition of an alloy consisting of 3.0 at. % Li in Cu while sputtering with 1 to 3 keV Ar(+) or He(+) at a flux of 10(12) to 10(14) cm(-2) sec(-1) (corresponding to a gross erosion rate of several mm/yr) at temperatures up to 430(0) C. It is found that the alloy is capable of reproducibly maintaining a complete lithium overlayer. The time dependent thickness of the overlayer depends strongly on the mass and energy spectrum of the incident particle flux. It was experimentally demonstrated that a significant fraction of the sputtered lithium is in the form Li(+) and is returned to the surface by an electric field such as the sheath potential at the limiter, or a tangential magnetic field such as the toroidal field at the first wall; consequently, the overlayer lifetime is essentially unlimited. The TRIM computer code was used to calculate the sputtering yield for pure metals and the partial sputtering yields of binary alloy components for various assumed solute concentration profiles. DOE

N85-29784# Oak Ridge National Lab., Tenn. Fusion Energy Div.
WHIST CODE CALCULATIONS OF IGNITION MARGIN IN AN IGNITION TOKAMAK
John Sheffield 12 Mar. 1985 6 p refs Presented at Ignition Design Point Workshop, Princeton, N.J., 12 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-009507; CONF-8503123-1) Avail: NTIS HC A02/MF A01

A simple global model was developed to determine the ignition margin of Tokamaks including electron and ion conduction losses. The model is compared with results from a 1.5 dimensional Whist code. DOE

N85-29785# California Univ., Livermore. Lawrence Livermore Lab.
TOKAMAK IGNITION/BURN EXPERIMENTAL RESEARCH DEVICE
C. D. Henning, R. G. Logan, W. L. Barr, R. H. Bulmer, J. N. Doggett, B. M. Johnston, J. D. Lee, R. W. Hoard, D. S. Slack, and J. H. Miller 4 Apr. 1985 8 p refs Presented at 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985 Submitted for publication
(Contract W-7405-eng-48)
(DE85-009999; UCRL-91876; CONF-850310-52) Avail: NTIS HC A02/MF A01

A superconducting Tokamak was designed with thin neutron shielding and aggressive magnet and plasma parameters. By so minimizing the inner radial dimensions of the Tokamak center post, coil, and shielding region, the plasma major radius is reduced with a corresponding reduction in device costs. The peak nuclear-heating rate in the superconducting TF coils is 22 nW/(cu)cm, which results in a steady heat load to the cryogenic system of 50 kW. Fast-wave, lower-hybrid heating is used to induce a 10-MA current in a moderate density plasma. Then pellet fueling raises the density to achieve ignition as the current decays in a few hundred seconds. Steady-state current drive in subignited conditions permits a 0.8 MW/sq m average wall loading to study plasma and nuclear engineering effects. DOE

N85-29786# California Univ., Livermore. Lawrence Livermore Lab.
FEASIBILITY STUDY OF A FISSION-SUPPRESSED TOKAMAK FUSION BREEDER
R. W. Moir, J. D. Lee, W. S. Neef, D. H. Berwald (TRW Energy Development Group, Redondo Beach, Calif.), J. K. Garner (TRW Energy Development Group, Redondo Beach, Calif.), R. H. Whitley (TRW Energy Development Redondo Beach, Calif.), N. Ghoniem (TRW Energy Development Group, Redondo Beach, Calif.), C. P. C. Wong (TRW Energy Development Group, Redondo Beach, Calif.), I. Maya (Princeton Plasma Physics Lab., N.J.), and K. R. Schultz (Westinghouse Electric Corp., Madison, Pa.) Dec. 1984 232 p refs
(Contract W-7405-eng-48)
(DE85-009099; UCID-20154) Avail: NTIS HC A11/MF A01

The preliminary conceptual design of a tokama fissile fuel producer is described. The blanket technology is based on the fission suppressed breeding concept where neutron multiplication occurs in a bed of 2 cm diameter beryllium pebbles which are cooled by helium at 50 atmospheres pressure. Uranium-233 is bred in thorium metal fuel elements which are in the form of snap rings attached to each beryllium pebble. Tritium is bred in lithium bearing material contained in tubes immersed in the pebble bed and is recovered by a purge flow of helium. The neutron wall load is 3 MW/m(2) and the blanket material is ferritic steel. The net fissile breeding ratio is 0.54 plus or minus 30% per fusion reaction. This results in the production of 4900 kg of (223)U per year from 3000 MW of fusion power. This quantity of fuel will provide makeup fuel for about 12 LWRs of equal thermal power or about 18 1 GW sub e LWRs. The calculated cost of the produced uranium-233 is between $23/g and $53/g or equivalent to $10/kg to $90/kg of U308 depending on government financing or utility financing assumptions. Additional topics discussed include the Tokamak operating mode (both steady state and long pulse considered), the design and breeding implications of using a poloidal divertor for impurity control, reactor safety, the choice of a tritium breeder, and fuel management. DOE

N85-29787# Brookhaven National Lab., Upton, N. Y. National Synchrotron Light Source.
EXPERIENCE WITH A HIGH-BRIGHTNESS STORAGE RING: THE NSLS 750 MeV VUV RING
John Galayda 1984 14 p refs Presented at the Workshop on Coherent and Collective Propagation of Relativistic E-Beams and Electromagnetic Radiation, Como, Italy, 13-16 Sep. 1984
(Contract DE-AC02-76CH-00016)
(DE85-010547; BNL-36172; CONF-8409163-5) Avail: NTIS HC A02/MF A01

The NSLS vuv ring is the first implementation of the proposals for a synchrotron radiation source with enhanced brightness. Its lattice is a series of achromatic bends with two zero gradient dipoles each, giving small damped emittance; and these bends are connected by straight sections with zero dispersion to accommodate wigglers and undulators without degrading the radiation damping properties of the ring. The virtues of the Chasman-Green lattice, its small betatron and synchrotron emittances, may be understood with some generality; e.g., the electron (GAMMA)m0c(2) energy and the number of achromatic bends M sets a lower limit on the betatron emittance of e/sub x/. 7.7 x 10(-13) (GAMMA) (2)/M meter radians. There is strong interest in extrapolation of this type of lattice to 6 GeV and to 32 achromatic bends. The progress toward achieving performance in the vuv ring limited by the radiation damping parameters optimized in its design is reported. DOE

N85-29788# Texas Univ., Austin. Inst. for Fusion Studies.
ELECTROMAGNETIC SOLITARY WAVES IN MAGNETIZED PLASMAS
R. D. Hazeltine, D. D. Holm (Los Alamos National Lab.), and P. J. Morrison Mar. 1985 19 p refs
(Contracts W-7405-eng-36; DE-FG05-80ET-53088)
(DE85-010084; DOE/ET-53088/173; IFSR-173) Avail: NTIS HC A02/MF A01

Hamiltonian formulation, in terms of noncanonical Poisson bracket, is presented for a nonlinear fluid system that includes reduced magnetohydrodynamics and the Hasegawa-Mima equation as limiting cases. The single helicity and exisymmetric versions possess three nonlinear Casimir invariants, from which a generalized potential can be constructed. Variation of the generalized potential yields a description of exact nonlinear stationary states. The new equilibrium, allowing for plasma flow as well as partial electron adiabaticity, are distinct from those found in conventional magnetohydrodynamic theory. They differ from electrostatic stationary states in containing plasma current and magnetic field excitation. One class of steady state solutions is shown to provide a simple electromagnetic generalization of drift solitary waves. DOE

N85-29789# Los Alamos Scientific Lab., N. Mex.
INERTIAL FUSION REACTORS AND MAGNETIC FIELDS
J. B. Cornwell and J. H. Pendergrass 1985 9 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contract W-7405-eng-36)
(DE85-009571; LA-UR-85-790; CONF-850310-50) Avail: NTIS HC A02/MF A01

The application of magnetic fields of simple configurations and modest strengths to direct target debris ions out of cavities can alleviate recognized shortcomings of several classes of inertial confinement fusion (ICF) reactors. Complex fringes of the strong magnetic fields of heavy ion fusion (HIF) focusing magnets may intrude into reactor cavities and significantly affect the trajectories of target debris ions. The results of an assessment of potential benefits from the use of magnetic fields in ICF reactors and of potential problems with focusing magnet fields in HIF reactors conducted to set priorities for continuing studies are reported. Computational tools are described and some preliminary results are presented. DOE

N85-29790# Los Alamos Scientific Lab., N. Mex.
CHEMICAL SPECTROSCOPY
J. Eckert, T. O. Brun (Argonne National Lab.)), A. J. Dianoux (ILL), J. Howard (Durham Univ.), J. J. Rush (NBS), and J. W. White (Oxford Univ.) 1984 19 p refs Presented at the Workshop on Sci. Opportunities with Advan. Facilities for Neutron Scattering, Shelter Island, N.Y., 23-26 Oct. 1984
(Contract W-7405-eng-36)
(DE85-009594; LA-UR-85-783; CONF-8410256-1) Avail: NTIS HC A02/MF A01

The purpose of chemical spectroscopy with neutrons is to utilize the dependence of neutron scattering cross sections on isotope and on momentum transfer (which probes the spatial extent of the excitation) to understand fundamental and applied aspects of the dynamics of molecules and fluids. Chemical spectroscopy is divided into three energy ranges: vibrational spectroscopy, 25-500 MeV, for which much of the work is done on Be-filter analyzer instruments; low energy spectroscopy, less than 25 MeV; and high resolution spectroscopy, less than 1 MeV, which typically is performed on backscattering spectrometers. Representative examples of measurements of the Q-dependence of vibrational spectra, higher energy resolution as well as extension of the Q-range to lower values at high energy transfers, and provisions of higher sensitivities in vibrational spectroscopy are discussed. High resolution, high sensitivity, and polarization analysis studies in low energy spectroscopy are discussed. Applications of very high resolution spectroscopy are also discussed. DOE

N85-29791# Stanford Linear Accelerator Center, Calif.
PLASMA WAKE FIELD ACCELERATOR
Pisin Chen and J. M. Dawson (California Univ., Los Angeles) Mar. 1985 7 p refs Presented at the 2nd Intern. Workhop on Laser Acceleration of Particles, 7 Jan. 1985
(Contract DE-AC03-76SF-00515)
(DE85-010538; SU-SLAC-PUB-3601; CONF-850128-13) Avail: NTIS HC A02/MF A01

A new scheme of electron acceleration, employing relativistic electron bunches in a cold plasma, is analyzed. The wake field of a leading bunch is derived in a single particle model. The model is extended to include finite bunch length effect. The relation between the charge distributions of the driving bunch and the energies transformable to the trailing electrons is discussed. It is shown that for symmetric charge distribution of the driving bunches, the maximum energy gain for a driven electron is 2(GAMMA)0mc(2). This limitation can be overcome by introducing symmetric charge distributions. DOE

N85-29792# Oak Ridge National Lab., Tenn. Engineering Physics and Mathematics Div.
MAGNETICS CALCULATIONS FOR AN ELMO BUMPY SQUARE
R. T. Santoro, N. A. Uckan, and R. J. Schmitt (McDonnell Douglas Astronautics Co., St. Louis) Mar. 1985 16 p refs Submitted for publication
(Contract DE-AC05-84OR-21400)
(DE85-010442; ORNL/TM-9542) Avail: NTIS HC A02/MF A01

Calculations have been carried out to determine the vacuum magnetic parameters, forces, and the use of trim coils in an ELMO Bumpy Square. A configuration having five mirror coils per side and an eight coil high field toroidal solenoid corner assembly was studied. Favorable magnetic parameters are achieved in the device. An on axis mirror ratio of 1.9, a global mirror ratio of 3.6, and excellent centering of plasma pressure contours are achieved. Particle losses are also minimal (< 5%). The magnetic forces acting between coils are comparable with those encountered in the EBT-I/S magnet configuration. Circular trim coils were found to be suitable for restoring hot electron ring locations that are displaced when the coil currents are varied for performing magnetic studies or for assessing the effects on the EBS of the global mirror ratio. DOE

N85-29793# Brookhaven National Lab., Upton, N. Y.
PRELIMINARY RESULTS ON OPEN ACCELERATING STRUCTURES
R. B. Palmer and S. Giordano 7 Jan. 1985 10 p refs Presented at the 2nd Intern. Workshop on Laser Acceleration of Particles, Los Angeles, 7-18 Jan. 1985
(Contract DE-AC02-76CH-00016)
(DE85-010231; BNL-36218; CONF-850128-14) Avail: NTIS HC A02/MF A01

Periodic structures consisting of rows of spherical conductors are considered. In a plasma linac, these spherical conductors would be formed from liquid droplets on whose surfaces a plasma would be formed. The field configurations have been investigated using copper spheres approximately 11 cm diameter and microwave radiation of approximately 30 cm wavelength. No suitable accelerating mode was found for relativistic particles using a single row of spheres, but with two parallel rows of spheres both accelerating and focusing modes were found. The accelerating modes is discussed over a grating surface, including a grating of parallel conducting rods. The coupling of these structures to incoming radiation are reexamined. DOE

N85-29794# Los Alamos Scientific Lab., N. Mex.
MEGAJOULE-CLASS SINGLE-PULSE KrF LASER TEST FACILITY AS A LOGICAL STEP TOWARD INERTIAL FUSION COMMERCIALIZATION
D. B. Harris and J. H. Pendergrass 1985 5 p refs Presented at the 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3-7 Mar. 1985
(Contract W-7405-eng-36)

(DE85-009590; LA-UR-85-748; CONF-850310-48) Avail: NTIS HC A02/MF A01

The cost and efficiency of megajoule class KrF laser single pulse test facilities were examined. A baseline design is described which illuminates targets with 5 MJ with shaped 10 ns pulses. The system uses 24 main amplifiers and operates with an optics operating fluence of 4.0 J/sq cm. This system has 9.0% efficiency and costs $200/joule. It is indicated that large amplifier modules and high fluences lead to the lowest laser system costs, but that only a 20% cost savings can be realized by going to amplifier modules larger than 200 kJ and/or fluences greater than 4 J/sq cm. The role of the megajoule class single pulse test facility towards inertial fusion commercialization is also discussed. DOE

N85-29795# TRW Energy Systems Group, Redondo Beach, Calif. Energy Div.

COAL-FIRED MHD COMBUSTOR DEVELOPMENT PROJECT, PHASE 3D Quarterly Technical Progress Report, 1 Nov. 1984 - 31 Jan. 1985

20 Feb. 1985 48 p

(Contract DE-AC22-84PC-70508)

(DE85-008822; DOE/PC-70508/T2; MHD-III-85-018; QTPR-3) Avail: NTIS HC A03/MF A01

The Coal-Fired MHD Combustor Development Project (phase 3D) is reported. The scope encompasses development work on the 50 MW/sub t/ combustor related to test support at the CDIF, fabrication and assembly of first and second stage hardware, plans for second stage design verification testing and power testing, and designs for a continuous slag rejector and low preheat inlet section. Progress includes the following: (1) operational verification testing of the first stage at the CDIF was completed; (2) assembly and checkout of the second first stage, two second stages, and PEM is 75 to 90% completed; (3) conceptual designs for a continuous slag rejector and low preheat inlet section are completed and low preheat preliminary design work is 75% completed; and (4) revision of the users' manual to include the second stage is 75% completed and a draft Test Plan for power train testing is reviewed. DOE

N85-29796# Avco-Everett Research Lab., Mass.

MHD CHANNEL DEVELOPMENT Quarterly Report, Jul. - Sep. 1984

Nov. 1984 66 p refs

(Contract DE-AC22-84PC-70507)

(DE85-008305; DOE/PC-70507/2) Avail: NTIS HC A04/MF A01

The modelling of the diagonal channel with resistive links was completed. A second series of laser doppler velocimeter (LDV) experiments was conducted on the Avco Mk VI channel using diagnostics provided by Mississippi State University. A long-duration test of the Mk VII channel with the objective of side wall development is in progress. Electrode drops in the Mk VI Reference Channel No. 4 operating without slag were measured, over a range of gas conductivities and magnetic field strengths. A set of master/slave current consolidation and control circuitry was tested for 40 hours on the Mk VII channel. The testing is continuing in parallel with the long-duration sidewall testing in progress under Task 2. The Mk VI and Mk VII test facilities were operated for a total of 73 hours: power was generated for 30 hours. The supersonic section of the Reference 4 diffuser was reworked to allow simultaneous use of the stagnation pressure probe and the LDV. Shim plates were added to the Mk VI magnet. DOE

N85-29797# California Univ., Livermore. Lawrence Livermore Lab.

PLASMA ENGINEERING MODELS OF TANDEM MIRROR DEVICES WITH HIGH-FIELD TEST-CELL INSERTS

M. E. Fenstermacher (TRW, Inc., Redondo Beach, Calif.) and R. B. Campbell (TRW, Inc., Redondo Beach, Calif.) 3 Apr. 1985 7 p refs Presented at 6th Topical Meeting on the Technol. of Fusion Energy, San Francisco, 3 Mar. 1985 Submitted for publication

(Contract W-7405-eng-48)

(DE85-010046; UCRL-92022; CONF-850310-62) Avail: NTIS HC A02/MF A01

Plasma physics and engineering models of tandem mirror devices operated with a high field technology test cell insert in the central cell, which were incorporated recently in the TMRBAR tandem mirror reactor physics code, are described. The models include particle and energy balance in the test cell region as well as the interactions between the test cell particles and those flowing through the entire device. The code calculations yield consistent operating parameters for the test cell, central cell, and end cell systems. A benchmark case for the MFTF-(ALPHA)+T configuration is presented which shows good agreement between the code results and previous calculations. DOE

N85-29798# Rome Univ. (Italy). Dipt. di Fisica.

SCREENING PHASE TRANSITIONS IN TWO-DIMENSIONAL COULOMB GAS

G. Gallavotti and F. Nicolo 10 Jul. 1984 36 p refs

(NOTA-INTERNA-830) Avail: NTIS HC A03/MF A01

Infrared properties of a Coulomb gas in two dimensions and with fixed ultraviolet cutoff are studied. The existence of infinitely many thresholds Tu = 1/Ke 1/8 pi (1-1/zu)sup-1 in the interval of temperatures 1/Ke[1/8 pi, 1/4 pi], where K is the Boltzmann constant and e = /e/ is the charge of the positive particle, is proved. Such thresholds are conjectured to reflect a sequence of transitions from a pure multipole phase (the Koesterlitz-Thouless region) to the plasma phase via an infinite number of intermediate phases. Mathematically the free energy becomes more and more differentiable as a function of the activity lambda, near lambda = 0, as the temperature decreases. Author (ESA)

N85-29799# Ruhr Univ., Bochum (West Germany). Inst. fuer Hoch- und Hoechstfrequenztechnik.

NONLINEAR PLASMA REACTIONS ON THE ANTENNA IMPEDANCE OF HIGH TRANSMISSION POWER SATELLITES Final Report, Feb. 1984

Karl-Heinz Bethke and Peter Edenhofer Bundesministerium fuer Forschung und Technologie Dec. 1984 123 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie

(BMFT-FB-W-84-053; ISSN-0170-1339) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 26

Numerical calculations of the input impedance of satellite antennas with regard to nonlinear reactions of high power satellites as well as the real plasma distribution and its temporal variations in the iono- and magnetosphere, including photoionization and secondary electron emission are developed. Using the results of a quasistatic probe theory (based on the kinetic gas theory to calculate the plasma sheath reactance), and hydrodynamic theory, the input impedance of a dipole antenna in a nonlinear, compressible inhomogenous plasma is formulated. In an iterative procedure, nonlinear plasma-antenna interaction terms are taken into account as source terms; the numerical calculations are based on collocation. A theory to consider sheath effects by utilizing a multilayer model for the plasma immersed antenna was developed. Author (ESA)

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N85-29800* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD FOR GROWTH OF CRYSTALS BY PRESSURE REDUCTION OF SUPERCRITICAL OR SUBCRITICAL SOLUTION Patent

Paul J. Shlichta, inventor (to NASA) (JPL, Pasadena, Calif.) 23 Apr. 1985 12 p Filed 26 Jan. 1982 Sponsored by NASA

(NASA-Case-NPO-15772-1; US-Patent-4,512,846;

US-Patent-Appl-SN-392944; US-Patent-Class-156-623Q; US-Patent-Class-23-295R) Avail: US Patent and Trademark Office CSCL 20B

Crystals of high morphological quality are grown by dissolution of a substance to be grown into the crystal in a suitable solvent under high pressure, and by subsequent slow, time-controlled reduction of the pressure of the resulting solution. During the reduction of the pressure interchange of heat between the solution and the environment is minimized by performing the pressure reduction either under isothermal or adiabatic conditions.

Official Gazette of the U.S. Patent and Trademark Office

N85-29801 Department of the Air Force, Washington, D.C.
PROCESS FOR THE EPITAXIAL DEPOSITION OF 3-5 COMPOUNDS UTILIZING A BINARY ALLOY AS THE METALLIC SOURCE Patent
K. P. Quinlan and T. E. Erstfeld, inventors (to Air Force) Issued 12 Mar. 1985 6 p Supersedes AD-D011097
(AD-D011663; US-Patent-4,504,329; US-Patent-Appl-SN-539603; US-Patent-Class-148-175) Avail: US Patent and Trademark Office CSCL 20/12

This patent provides for the deposition of group 3-5 ternary epitaxial films onto the surfaces of suitable semiconductor substrates. The deposition is accomplished by a vapor phase epitaxy-hydride technique using a group 3 binary alloy as a group 3 metal source and phosphine, arsine or stibine as a group 5 hydride source. GRA

N85-29802# Japan Broadcasting Corp., Tokyo. Image Devices Research Div.
A NEW HIGH-RESOLUTION PICKUP TUBE FOR LIVE X-RAY TOPOGRAPHY
Tatsuro Kawamura, Takao Kuriyama, Takashi Yamashito, Naohiro Goto, Fumio Sato, and Jun-ichi Chikawa Dec. 1984 11 p refs (NHK-Labs-Note-309; ISSN-0027-657X) Avail: NTIS HC A02/MF A01

X-ray topographic images normally require exposures of up to several hours. Real-time observation is made possible by combining an X-ray television system with a high-power X-ray generator, with instantaneous imaging on a television monitor. Dynamic, as well as static, observation of plastic deformation, dislocation motion, crystal growth, and phase transformation are possible. For this purpose, a high-resolution X-ray sensing tube with an amorphous 20-micron thick Se-As alloy photoconductive layer was combined with a diode-operation impregnated-cathode Saticon (DIS) gun. A limiting resolution of 6 microns and low lag characteristics (less than 1% after one frame) were achieved. However, the range in which a crystal can be observed is restricted by the electron-beam scanning area of the tube, so the next step will be to use a high definition television system of 1125 lines (twice the norm) and to achieve a very high resolution by narrowing the scanning electron beam. F.M.R.

N85-29803# Colorado State Univ., Fort Collins.
GROWTH MECHANISM AND PROPERTIES OF THE THERMAL AND ANODIC OXIDES OF THE 3-5 COMPOUND SEMICONDUCTORS Final Report, 17 Dec. 1981 - 13 Dec. 1984
C. W. Wilmsen Mar. 1985 14 p
(Contract DAAG29-82-K-0032)
(AD-A153406; ARO-18330.9-EL) Avail: NTIS HC A02/MF A01 CSCL 20/12

The mechanisms of oxide growth on InP, GaP, GaAs, and InGaAs were investigated and their electrical properties measured. Islands were observed as the initial stage of anodization of InP and GaAs, but the details of the growth on the two materials are different. The thermal oxides of InP and GaP also differ in composition and surface topography. InP forms bubbles and GaP has pits under the oxide. Traps at the deposited insulator/InP interface were also investigated. GRA

N85-29804# Centre National de la Recherche Scientifique, Meudon-Bellevue (France).
PROCEEDINGS OF THE 14TH EUROPEAN SOLID STATE DEVICE RESEARCH CONFERENCE INCLUDING SOLID STATE DEVICE TECHNOLOGY, ESSDERC 84
G. T. Geneva Sep. 1984 444 p refs Proc. held in Lille, 10-13 Sep. 1984; sponsored by European Physical Society
(AD-A153409) Avail: NTIS HC A19/MF A01 CSCL 20/12

Proceedings of the 14th European Solid State Device Research Conference are presented. Included are abstracts from works posted or presented. G.L.C.

N85-29805# Lasertron, Inc., Burlington, Mass.
1.5 MICROMETER GaInAsP HIGH PULSED POWER DIODE LASERS Final Report, 15 Sep. 1981 - 31 Dec. 1984
J. J. Hsieh 4 Mar. 1985 6 p
(Contract DAAG29-81-C-0036)
(AD-A153568; ARO-18450.1-PH-S) Avail: NTIS HC A02/MF A01 CSCL 20/12

The growth condition for fabricating 1.5 micron lasers using LPE techniques has been established. High power performance and external quantum efficiency of the laser are studied. GRA

N85-29806# Technische Hochschule, Darmstadt (West Germany).
MICRO-REACTIONS OF METAL CONTACTS ON VARIOUS TYPES OF GaAs SURFACES Annual Report, Jan. 1984 - Jan. 1985
H. L. Hartnagel, K. H. Kretschmer, B. R. Sethi, and J. Wuerfl Jan. 1985 59 p
(Contract DAJA45-83-C-0012)
(AD-A153650; AD-F300606; AR-2) Avail: NTIS HC A04/MF A01 CSCL 07/4

Further XPS analysis results of a range of GaAs surfaces are reported which are produced by various technological steps such as etching in basic or acidic solutions as customary before the deposition of metals. The findings of lateral material transport between co-planar electrodes, on Metal-GaAs interdiffusion due to typical operational device conditions and on the electron wind in narrow conductors are presented. GRA

N85-29807# Erlangen-Nuremberg Univ. (West Germany). Inst. fuer Angewandte Physik.
ELECTRONIC STATES IN SILICON AND ON ITS INTERFACES Final Technical Report, Dec. 1980 - Mar. 1984
M. Schulz, K. Hofmann, G. Pensl, and K. H. Hoelzlein Jan. 1985 102 p
(Contract DAJA37-81-C-0002; DA Proj. 1T1-61102-BH-57)
(AD-A153664; AD-E401312) Avail: NTIS HC A06/MF A01 CSCL 20/8

The report contains two separate sections: (1)Properties of the new oxygen donor in silicon; and (2)Process-induced interface and bulk states in MOS structures. (1) The so-called new oxygen donor defect is formed in Czrochalski-grojwn silicon during annealing at temperatures around 650 C. The general properties are explained by SiO sub x precipitates in bulk silicon. The trap spectrum observed is an interface state spectrum for these oxide inclusions. (2) The effect of processing on the generation of interface states and bulk silicon traps is analyzed in MOS structures. Simple VLSI process steps are simulated by postoxidation annealing in the temperature range T=600 - 1150 C. Interface and bulk states are strongly generated for anneal temperatures below 900 C. The bulk silicon trap density steeply increases within 100nm from the interface. GRA

N85-29808# Washington Univ., Seattle. Dept. of Physics.
QUANTIZED HALL CONDUCTANCE AS A TOPOLOGICAL INVARIANT
Qian Niu, D. J. Thouless, and Yong-Shi Wu Oct. 1984 17 p refs
(Contract DE-AC06-8134-40048)
(DE85-007796; DOE/ER-40048/28-P4) Avail: NTIS HC A02/MF A01

Whenever the Fermi level lies in a gap the bulk Hall conductance are expressed in a topologically invariant form showing the quantization explicitly. The new formulation generalizes the earlier result by TKNN to the situation where many body interaction

and substrate disorder are also present. When applying to the fractional quantized Hall effect it is concluded that there must be a symmetry breaking in the many body ground state. The possibility of writing the fractionally quantized Hall conductance as a topological invariant is also discussed. DOE

N85-29809# California Univ., Berkeley. Lawrence Berkeley Lab.
TEM COMBINED WITH Al/SUB x/Ga/SUB 1-x/ AS MARKER LAYERS AS A TECHNIQUE FOR THE STUDY OF GaAs MBE GROWTH
J. H. Mazur, J. Washbrn, R. Fischer, T. Henderson, J. Klem, W. T. Masselink, W. Kopp, and H. Morkoc Jan. 1985 18 p refs Presented at the Arizona State Univ. Centennial Symp. on High-Resolution Electron Microscopy, Tempe, Ariz., 7 Jan. 1985 Prepared in cooperation with Illinois Univ., Urbana
(Contract DE-AC03-76SF-00098)
(DE85-008451; LBL-19130; CONF-850142-4) Avail: NTIS HC A02/MF A01

It is demonstrated that transmission electron microscopy of cross-section specimens combined with Al(x)Ga(1-x)As marker layers can be used to monitor MBE (molecular beam epitaxy) growth of GaAs films. A similar method could be used to study growth morphology of any other film provided that very small mismatch marker layers are available. This technique has potential for quantitative assessment of the surface diffusion during thin film deposition. DOE

N85-29810# California Univ., Berkeley. Lawrence Berkeley Lab.
PSEUDOPOTENTIALS AND TOTAL ENERGY CALCULATIONS: APPLICATIONS TO CRYSTAL STABILITY, VIBRATIONAL PROPERTIES, PHASE TRANSFORMATIONS, AND SURFACE STRUCTURES
Steven G. Louie Jul. 1984 66 p refs Presented at the Antwerp Advan. Study Inst. on Electon. Struct., Dyn. and Quantum Struct. Properties of Condensed Matter, Priorij Corsendank, Belgium, 16-27 Jul. 1984 Submitted for publicaion
(DE85-007657; LBL-18941; CONF-8407114-1) Avail: NTIS HC A04/MF A01

A review of the applications of the pseudopotential method and total energy techniques to the electronic and structural properties of solids is presented. With this approach, it has recently become possible to determine with accuracy crystal structures, lattice constants, bulk moduli, shear moduli, cohesive energies, phonon spectra, solid-solid phase transformations, and other static and dynamical properties of solids. The only inputs to these calculations, which are performed either with plane wave of LOAO bases, are the atomic numbers and masses of the constituent atoms. Calculations have also been carried out to study the atomic and electronic structure of surfaces, chemisorption systems, and interfaces. Results for several selected systems including the covalent semiconductors and insulators and the transition metals are discussed. The review is not exhaustive but focuses on specific prototype systems to illustrate recent progress. DOE

N85-29811# Harvard Univ., Cambridge, Mass. Dept. of Physics.
CARRIER LOSS IN DISPERSIVE TRANSPORT IN AMORPHOUS SEMICONDUCTORS
J. R. Eggert 1984 4 p refs Presented at the 17th Intern. Conf. on the Phys. of Semiconductors, San Francisco, 6 Aug. 1984
(Contract DE-FG02-84ER-45070)
(DE85-009122; CONF-840879-12) Avail: NTIS HC A02/MF A01

The effects on dispersive transport of carrier loss due to deep trapping or monomolecular recombination are calculated via simple arguments. The Hecht analysis of charge collection is shown to be valid in the presence of dispersive transport. Approximate solutions are given for the case of an exponcntial tail. DOE

N85-29812# Sandia Labs., Albuquerque, N. Mex. Microsensor Div.
SUMMARY OF RECENT STUDIES ON AlGaAs/GaAs RADIATION HARDENED PHOTODIODES
J. J. Wiczer 4 Mar. 1985 6 p refs Presented at the Southwest Conf. on Optics, Albuquerque, N. Mex., 4 Mar. 1985
(Contract DE-AC04-76DP-00789)
(DE85-009501; SAND-84-26780; CONF-850345-6) Avail: NTIS HC A02/MF A01

The results of several studies assessing the radiation hardness of a new type of double heterojunction, AlGaAs/GaAs photodiode is summarized. These studies include transient and permanent damage experiments. Transient studies indicate that double heterostructure AlGaAs/GaAs photodiodes generate 40 times less photocurrent than conventional silicon photodiodes during exposure to ionizing radiation pulses. Permanent damage studies with neutrons, Co(60) gamma rays, and high energy electron beam sources indicate only minor changes in operational characteristics after exposures. These studies have shown a 20% degradation in optical response and a factor of 8 increase in photodiode leakage current after exposure to 3.6 x 10(15) neutron/cm(2) fluence. Conventional silicon photodiodes exhibit this type of degradation after exposures to 10(12) to 10(13) neutrons/cm(2) fluences. These characteristics are important for many specialized applications requiring radiation hardness. DOE

N85-29813# Argonne National Lab., Ill. Materials Science and Technology Div.
STUDY OF THE EQUILIBRIUM VACANCY ENSEMBLE IN ALUMINUM USING 1D- AND 2D-ANGULAR CORRELATION OF ANNIHILATION RADIATION
M. J. Fluss, S. Berko (Brandeis Univ.), B. Chakraborty, K. R. Hoffmann (Brandeis Univ.), P. Lippel (Brandeis Univ.), and R. W. Siegel 12 Mar. 1985 5 p refs Presented at the 7th Intern. Conf. on Positron Annihilation, New Delhi, 6-11 Jan. 1985
(Contracts W-7405-eng-48; W-31-109-eng-38; Grant NSF DMR-79-26035)
(DE85-008967; UCRL-92349; CONF-850169-2) Avail: NTIS HC A02/MF A01

One- and two-dimensional angular correlation of positron-electron annihilation radiation (1D and 2D-ACAR) data have been obtained between 293 and 903 K for single crystals of aluminum. The peak counting rates vs temperature, which were measured using the 1D-ACAR technique, provide a model independent value for the temperature dependence of the positron trapping probability. Using these results it is possible to strip out the Bloch state contribution from the observed 2D-ACAR surfaces and then compare the resulting defect ACAR surfaces to calculated 2D-ACAR surfaces for positrons annihilating from the Bloch, monovacancy, and divacancy-trapped states. The result of this comparison is that the presence of an increasing equilibrium divacancy population is consistent with the observed temperature dependence of ACAR data at high temperature in Al and that the present results when compared to earlier studies on Al indicate that the ratio of the trapping rates at divacancies and monovacancies is of order two. DOE

N85-29814# Missouri Univ., Kansas City.
THEORETICAL STUDIES ON THE STRUCTURES OF INSULATING AND METALLIC GLASSES Annual Progress Report, 1 Jul. 1984 - 30 Jun. 1985
Wai-Yim Ching Jan. 1985 13 p
(Contract DE-FG02-84ER-45170)
(DE85-010022; DOE/ER-45170/1) Avail: NTIS HC A02/MF A01

The major accomplishments on the structures of insulating and metallic glasses are reported. Covered are: (1) completion of a study on the band structures of all polycrystalline forms of silicon dioxide; (2) study of electronic structure of Si/sub x/Ge/sub 1-x/ semiconductor solid solutions; (3) investigation of crystalline lithium metasilicate and lithium disilicate through structural analysis and band structure calculation; (4) preparation of canonical potentials and basis functions for all transition metal elements to be used in the electronic structure calculations of metallic glasses; (5) comparative study of the electronic structures of crystalline Ni3P and amorphus Ni75P25 glass. DOE

N85-29815# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.

DRIFT MOBILITIES BY TIME-OF-FLIGHT METHODS AND TIME-DEPENDENT PHOTOTRANSPORT IN THE NANOSECOND REGIME IN AMORPHOUS SEMICONDUCTORS Annual Report, 1 May - 30 Apr. 1985

William Paul Mar. 1985 31 p refs
(Contract DE-FG02-84ER-45070)
(DE85-008729; DOE/ER-45070/1) Avail: NTIS HC A03/MF A01

The purpose is to elucidate transient phototransport and related phenomena in amorphous semiconductors, which have a bearing on the steady-state photoelectronics properties and the underlying electronic band structure. The approach is to produce samples of a-Si:H and a-Si:H:F, to characterize them very well chemically, structurally and optically, and then to study the dispersive transport by the time of flight technique. This gives information on the mode of transport in these disordered substances. By studying the collected charge versus applied electric field on intrinsic and doped samples, one is also able to obtain information on the electron and hole lifetimes for deep trapping as a function of the position of the Fermi level, and thereby on the energetic position of the neutral and negatively-charged dangling bond states and on the modifications to the density-of-states in the conduction and valence band tails by the various dopants. These results are important both for fundamental understanding of this class of semiconductors and for improvement of devices based on them for solar cell and thin film transistor applications. DOE

N85-29816# Los Alamos Scientific Lab., N. Mex.

CRYSTAL GROWTH FROM THE VAPOR IN LOW GRAVITY ENVIRONMENTS

Robert P. Santandrea 1985 10 p refs Presented at Spring Natl. Meeting of AIChE, Houston, Tex., 24 Mar. 1985
(Contract W-7405-eng-36)
(DE85-009628; LA-UR-85-1062; CONF-850357-9) Avail: NTIS HC A02/MF A01

Effects of Earth's gravity on fluids and gases are discussed. Crystal growth in microgravity was studied since the first Skylab mission. Crystal growth from the vapor was accomplished in space by use of the chemical vapor transport method, and the principles behind this method. The results obtained in space are discussed, particularly in the germanium chalcogenide systems. Chemical vapor deposition in space offer promising applications. DOE

N85-29817# Sandia Labs., Albuquerque, N. Mex.

ELECTRON SPIN RESONANCE STUDY OF INTERFACE STATES INDUCED BY ELECTRON INJECTION IN METAL-OXIDE-SEMICONDUCTOR DEVICES

R. E. Mikawa and P. M. Lenahan 1985 26 p refs
(Contract DE-AC04-76DP-00789)
(DE85-009502; SAND-85-03460) Avail: NTIS HC A03/MF A01

Structural damage at the Si/SiO2 interface in metal-oxide-semiconductor devices resulting from the emission of the electrons from the silicon into the oxide involves an amphoteric trivalent silicon defect, termed p sub b. The p sub b center is responsible for the electron injection induced interface states. The effects of electron injection are similar to those of ionizing radiation to the extent that in both cases P sub b centers are generated at the Si/SiO2 interface. However, the effects are not identical; ionizing radiation creates another trivalent silicon defect, termed E prime, in the oxide. Researchers were unable to observe any E prime generation in oxides subjected to electron injection. There appears to be a strong correlation between the number of trapped electrons and the electron injection induced P sub b center interface states; this observation suggests that the trapping of electrons in the bulk of the oxide is in some way related to the creation of the P sub b center interface state defects. In addition, dry oxides subjected to a deuterium/nitrogen anneal exhibit less electron trapping than otherwise identical oxides which have been subjected to a hydrogen/nitrogen anneal. This observation is consistent with the idea that a hydrogen bond breaking event may be involved in electron capture. DOE

N85-29818# State Univ. of New York, Stony Brook. Dept. of Materials Science and Engineering.

EFFECTS OF GAMMA-RAY IRRADIATION ON DISLOCATIONS IN SODIUM NITRATE SINGLE CRYSTALS

H. Solnick-Legg, P. J. Herley, and P. W. Levy Dec. 1984 7 p refs Presented at the 10th Intern. Symp. on Reactivity of Solids, Dijon, France, 1 Aug. 1984 Submitted for publication Prepared in cooperation with Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE85-008291; BNL-35775; CONF-8408151-1) Avail: NTIS HC A02/MF A01

The topography of the etch pits formed on the (100) cleavage surfaces of unirradiated and irradiated NaNO3 single crystals was studied. The principal etch pit alignments are consistent with dislocation families of the type (100) [011], (211) [011], and (111) [011]. The pit density increases from 1.4 (plus or minus 0.2) x 10 to the 9th power/cm(2) at zero dose to 7.3 (plus or minus 0.2) 100,000/cm(2) at 5.0 x ten to the 8th power rad. With increasing dose the pit density distribution narrows and clusters at 1.0 x one million pits/cm(2) at doses above 5.0 x rad. Above this dose radiolytic-induced micro bumps or structures are observed that precede the onset of radiolytic decomposition that is visible at 2.5 x 10 to the 9th power rad. These asymmetric structures appear to nucleate at the same sites as the chemically created etch pits and are aligned in the same principal directions. These observations indicate that dislocations are important sites for nucleating radiation induced decomposition and internal radiolytic gas generation. DOE

N85-29819# Sandia Labs., Albuquerque, N. Mex.

OXYGEN-NITROGEN INTERACTIONS IN ION-IMPLANTED SILICON

Herman J. Stein 1985 5 p refs Presented at the 2nd Spring Meeting of the Materials Research Society, San Francisco, 15 Apr. 1985
(Contract DE-AC04-76DP-00789)
(DE85-010091; SAND-84-2308C; CONF-850421-2) Avail: NTIS HC A02/MF A01

Interaction of oxygen and nitrogen in ion implanted crystalline silicon layers was investigated by infrared absorption. Infrared absorption bands which are not produced by either (14)N or (16)O alone are observed after sequential implantation of (14)N and (16)O into overlapping profiles followed by annealing at 500(0)C. The new bands indicate oxygen nitrogen interactions and are ascribed to Si-N vibrational modes with oxygen in nearby interstitial sites. DOE

N85-29820# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

LOW-ENERGY ELECTRON DIFFRACTION EXPERIMENT AND THEORY

M. A. VanHove Mar. 1985 15 p refs Presented at the 5th Gen. Conf. of the Condensed Matter Div. of the European Phys. Soc., Berlin, 18-22 Mar. 1985 Submitted for publication
(Contract DE-AC03-76SF-00098)
(DE85-009967; LBL-19254; CONF-8503126-1) Avail: NTIS HC A02/MF A01

The current state of structure determination using Low Energy Electron Diffraction (LEED) intensities is reviewed. Experimental and theoretical advances are examined, and lessons from successes and failures are discussed. The relationship between LEED and other techniques is also covered. DOE

N85-29821# California Univ., Livermore. Lawrence Livermore Lab.

OPERATION OF HFTF TO TEST THE MIT 12 T COIL

J. R. Miller 28 Mar. 1985 43 p
(Contract W-7405-eng-48)
(DE85-010409; UCID-20394) Avail: NTIS HC A03/MF A01

The MIT coil tested in HFTF to a peak field of very nearly 12 T. The accomplishment is noteworthy as a demonstration of reactor relevant superconductors to high field in a realistic coil environment. Just the operation of the High Field Test Facility (HPTF) in providing the necessary test conditions is also no trivial feat. This note reports the work involved in testing the MIT 12T

coil, with emphasis given to the test facility itself. Data specific to the MIT coil are relegated to appendices. DOE

N85-29822# Columbia Univ., New York.
[ELECTRON-PROTON COLLIDER OPTION FOR THE SUPERCONDUCTING SUPER COLLIDER] Final Report, 1 Jul. 1980 - 28 Feb. 1985
1985 8 p
(Contract DE-AC02-80ER-10716)
(DE85-010146; DOE/ER-10716/004) Avail: NTIS HC A02/MF A01

The physics of ep collisions has been demonstrated any number of times to be tremendous. If any features of hadron-hadron collisions differ in any essential way from e(+)e(-) collider phenomena, then it is imperative to have a means of investigating these differences with ep collisions. The uniqueness of the electron-proton collider is in the study of possible wrong-handed contributions to the weak interaction. Therefore the availability of electrons and positrons of either helicity is of the highest priority in the design of the collider. Other problems which are unique to electron-proton colliders are related to the high current multi-bunch nature of the beams required in the colliders. Emphasis has been on the special problems related to making collisions between electron and proton beams. DOE

N85-29823# California Univ., Livermore. Lawrence Livermore Lab.
RESOLVABILITY OF DEFECT ENSEMBLES WITH POSITRON ANNIHILATION STUDIES
M. J. Fluss, R. H. Howell, I. J. Rosenberg, and P. Meyer 12 Nov. 1984 8 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 26-30 Nov. 1984 Submitted for publication
(Contract W-7405-eng-48)
(DE85-010041; UCRL-91779; CONF-841157-89) Avail: NTIS HC A02/MF A01

Recent advances in the use of positron annihilation to study defect ensembles in and on the surfaces of metals, are pointing the way towards studies where particular positron-electron annihilation modes may be identified and studied in the presence of one another. Although a great deal is understood about the annihilation of positrons in ostensibly defect-free metals, much less is understood when the positron annihilates in complex defect systems such as liquid metals, amorphous solids, or at or near the vacuum-solid interface. The results of three experiments, all of which demonstrate means by which one can resolve various positron annihilation channels from one another, are discussed. DOE

N85-29824# Virginia Univ., Charlottesville. Dept. of Chemistry.
STRUCTURAL AND PHYSICAL STUDIES ON A NEW CLASS OF LOW-DIMENSIONAL CONDUCTING MATERIAL: FeOCL INTERCALATED WITH TTF AND RELATED MOLECULES
B. A. Averill, S. M. Kauzlarich (Michigan State Univ., East Lansing), B. K. Teo (Bell Labs., Murray Hill, N.J.), and J. Faber, Jr. (ANL) Jan. 1985 5 p refs Presented at the Intern. Conf. on the Phys. and Chem. of Low-Dimensional Syn. Metals, Abano-Terme, Italy, 17 Jun. 1984
(Contract W-31-109-eng-38)
(DE85-009701; CONF-8406192-2) Avail: NTIS HC A02/MF A01

Intercalation of TTF (tetrathiafulvalene), TTN (tetrathianaphthalene), and related organosulfur electron donors into FeOCl results in a significant expansion along the interlayer axis, with the organosulfur molecules apparently inclined with respect to this axis. Electronic spectra suggest that the intercalates are semiconductors with band gaps of ca. 0.4 - 0.5 eV, consistent with previous conductivity data. Elastic neutron diffraction data (10 K) show that magnetic ordering of the FeOCl host is abolished upon intercalation. DOE

N85-29825# Virginia Univ., Charlottesville. Dept. of Physics.
MAGNETIC IMPURITIES IN SUPERCONDUCTORS Progress Report, 1 Jul. 1984 - 30 Jun. 1985
J. Ruvalds 1985 37 p refs
(Contract DE-FG05-84ER-45113)
(DE85-008372; DOE/ER-45113/1) Avail: NTIS HC A03/MF A01

The progress of the following studies is reported: (1) susceptibility and order parameter for a superconductor with coupled magnetic impurities, (2) resistivity from magnetic impurity pairs in metallic alloys, (3) critical field of a superconductor containing magnetic impurities, (4) dynamics of charge density waves, and (5) dynamics of spin density waves in the presence of impurities. Representative examples of the results are presented. DOE

N85-29826# Rome Univ. (Italy). Dipt. di Fisica.
FIELD THEORY OF THE METAL-INSULATOR TRANSITIONS IN RESTRICTED SYMMETRIES
C. Castellani and C. DiCastro 9 Jul. 1984 18 p refs
(NOTA-INTERNA-829) Avail: NTIS HC A02/MF A01

The theory of interacting electrons in disordered systems which can be derived mapping the Landau normal Fermi liquid theory into a generalized nonlinear sigma-model and its renormalization group analysis is summarized. The mechanism associated with spin fluctuation enhancement, which leads the effective interaction couplings to diverge at a finite step of the renormalization group procedure is outlined. This divergency drives the group equations out of their validity region. Symmetry restrictions to obtain nontrivial fixed points of the group equations in 2 + sigma dimension are listed. Universality classes (magnetic impurities, external magnetic fields, spin-orbit impurity scattering) for the corresponding metal-insulator transition are obtained.Author (ESA)

N85-29827# Rome Univ. (Italy). Dipt. di Fisica.
ON THE GROUP-THEORETICAL APPROACH TO THE ENERGY SPECTRA PROBLEM OF CHARGE CARRIERS IN CUBIC SOLIDS
K. A. Rustamov (Academy of Sciences of the Azerbaijan, Baku, USSR) and A. M. Babaev 30 Jan. 1985 10 p refs Sponsored by CNR and USSR Academy of Sciences
(PREPRINT-435) Avail: NTIS HC A02/MF A01

The Kane spectra formula is obtained from the specification of the equations invariant under the rotational group. The generalization of the Kane model of the charge carriers energy spectra for diamondlike solids is also considered. Author (ESA)

N85-29107# Joint Publications Research Service, Arlington, Va.
RIFA OF SWEDEN CONDUCTS RESEARCH IN 3-5 MATERIALS
Heinz-Friedberg *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-035) 29 Oct. 1984 p 29-31 Transl. into ENGLISH from Elektron. Ind. (Heidelberg), no. 7/8, 1984 p 70-71 (For primary document see N85-29102 18-31)
Avail: NTIS HC A04/MF A01

N85-29759# Johann-Wolfgang-Goethe-Univ., Frankfurt am Main (West Germany). Physikalisches Inst.
OPTICALLY NONLINEAR AND BISTABLE BEHAVIOUR OF DIRECT GAP SEMICONDUCTORS
C. Klingshirn, K. Bohnert, H. Kalt, and K. Kempf (LITEF) *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 14 p refs (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

N85-29760# Royal Signals and Radar Establishment, Malvern (England).
OPTICAL BISTABILITY IN Cd(x)Hg(1-x)Te
A. Miller, D. Craig, G. Parry (Univ. College, London), J. G. H. Mathew, and A. K. Kar *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 11 p refs Prepared in cooperation with Heriot-Watt Univ., Edinburgh (For primary document see N85-29757 18-74)
Avail: NTIS HC A10/MF A01

N85-29768# British Telecom International (England). Research Labs.
THE POTENTIAL OF SEMICONDUCTORS FOR OPTICAL INTEGRATED CIRCUITS
S. Ritchie and A. G. Steventon *In* AGARD Digital Opt. Circuit Technol. Mar. 1985 20 p refs (For primary document see

N85-29757 18-74)
Avail: NTIS HC A10/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N85-29828# Army Military Personnel Center, Alexandria, Va.
NATURAL CONVECTION IN SQUARE PARTITIONED ENCLOSURES
E. B. Zimmerman 28 Mar. 1985 244 p
(AD-A153707; AD-F630675) Avail: NTIS HC A11/MF A01 CSCL 20/13

Natural convection heat transfer in square air filled enclosures with differentially heated vertical side walls and horizontal connecting end walls that were either perfectly conducting or adiabatic have been investigated between Rayleigh numbers of 10,000 to 1,000,000 by a finite difference method. Enclosures that were free of obstructions and enclosures fitted with centrally mounted vertical baffles attached to the floor and ceiling were studied, Baffle conductivity was investigated at 2 and 500 times that of air. The size of the aperture opening between the upper and lower baffle was maintained at one half the enclosure height and the aperture location was varied to study the effects on the heat transfer and flow properties on the enclosure. GRA

N85-29829# Stanford Linear Accelerator Center, Calif.
CONSTRUCTING A BIT STRING UNIVERSE Progress Report
H. Pierre Noyes, Michael J. Manthey (New Mexico Univ., Albuquerque), and Christopher Gefwert (Academy of Finland, Helsinki) Feb. 1984 12 p refs Presented at the Oxford Quantum Gravity Discussion Conf., Oxford, 21-23 Mar. 1984
(Contract DE-AC03-76SF-00515)
(DE85-006317; SU-SLAC-PUB-3290; CONF-8403174-1) Avail: NTIS HC A02/MF A01

A case is presented for discrete, constructive physics that generates four scale constants, a connection to laboratory events and scattering theory that gives these to the dimensional constants c, h, m/sub p/, and G, and a tentative quantum number assignment consistent with standard model for leptons and quarks with three generations. Current first approximations from the theory are given. This understanding of wave-particle dualism and observational cosmology creates no more experimental paradoxes than currently accepted views - perhaps fewer. DOE

N85-29830# Argonne National Lab., Ill.
THERMODYNAMIC PROPERTIES OF LIQUID Li-Ph, Na-Pb AND K-PLC]B ALLOYS: SIMILARITIES AND DIFFERENCES
M. I. Saboungi and J. Ellefson 1985 4 p refs Presented at 167th Electrochem. Soc. Meeting, Toronto, 12 May 1985
(Contract W-31-109-eng-38)
(DE85-004074; CONF-850542-3) Avail: NTIS HC A02/MF A01

The thermodynamic properties (e.g., activities, activity coefficients, entropies, free energies of mixing) were determined for liquid Li-Pb, Na-Pb, and K-Pb alloys over the entire composition range. For the two latter systems, a solid electrolyte consisting of either Na-(BETA)Al2O3 or K-(BETA)Al2O3 was used in the electrochemical cell which was operated by a standard coulometric titration technique. The results show an unusual composition dependence of the excess chemical potential of the alkali metal. For Li-Pb and K-Pb, a single inflection point is obtained at compositions around 20 at. % and 50 at. % Pb, respectively, while three inflection points are present in the Na-Pb system at about 20, 33, and 50 at. % Pb. DOE

N85-29831# Argonne National Lab., Ill. Chemistry Div.
THERMODYNAMIC SYSTEMATICS OF OXIDES OF AMERICIUM, CURIUM AND NEIGHBORING ELEMENTS
L. R. Morss 1984 12 p refs Presented at Intern. Chem. Congr. of Pacific Basin Society., Honolulu, Hawaii, 16 Dec. 1984
(Contract W-31-109-eng-38)
(DE85-009704; CONF-841210-22) Avail: NTIS HC A02/MF A01

Recently-obtained calorimetric data on the sesquioxides and dioxides of americium and curium are summarized. These data are combined with other properties of the actinide elements to elucidate the stability relationships among these oxides and to predict the behavior of neighboring actinide oxides. DOE

N85-29832# Los Alamos Scientific Lab., N. Mex.
GRAVITATIONAL PROPERTIES OF ANTIMATTER
T. Goldman and Michael Martin Nieto 1985 13 p refs Presented at the 3rd LEAR Workshop, Tignes-Savoie, France, 19-26 Jan. 1985
(Contract W-7405-eng-36)
(DE85-009601; LA-UR-85-1092; CONF-850152-2) Avail: NTIS HC A02/MF A01

Quantum gravity and the principle of equivalence are discussed. It is noted that modern descriptions of gravity, such as fiber bundles and higher dimensional spacetimes, allow violations of the commonly stated form of the principle of equivalence, and of CPT. Indirect arguments and experimental tests of the expected gravitational properties of CPT-conjugate states are reviewed. It is concluded that a direct experimental test of the gravitational properties of antimatter, at the 1% level, would be of great value. Some experimental reasons are identified which make the antiproton a prime candidate for this test. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N85-29833# Department of Defense, Washington, D. C.
SELECTED UNIVERSITY LABORATORY NEEDS IN SUPPORT OF NATIONAL SECURITY
29 Apr. 1985 67 p
(AD-A153511) Avail: NTIS HC A04/MF A01 CSCL 05/1

The Report of the House Armed Services Committee on the 1984 Department of Defense Authorization Act contained the following request: Many of the university laboratories in which Department of Defense research programs are conducted are obsolete and in need of major modernization or replacement. The committee believes a study should be undertaken on the need to modernize university laboratories in the physical sciences, earth and ocean sciences, atmospheric sciences, engineering, computer sciences and other fields essential to our long-term national security. The survey should: (1) document the laboratory needs of universities presently engaged in Department of Defense competitive research programs, (2) assess priorities by academic field, (3) provide estimates of costs to meet these needs, (4) provide specific recommendations appropriate to the Department of Defense and others designed to address the need, and (5) state the consequences to our long-term national security. This report is a response to that request. GRA

N85-29834# Logistics Management Inst., Bethesda, Md.
COST SAVINGS FROM MULTIYEAR CONTRACTING Final Report, Oct. 1983 - Oct. 1984
J. S. Domin Oct. 1984 44 p

(Contract MDA903-81-C-0166)
(AD-A153564; LMI-RE405) Avail: NTIS HC A03/MF A01 CSCL 05/3

Two multilayer contracts are reviewed to determine the savings that are being realized over the cost of annual contracting for the same work; one is an Army contract with the Sikorsky Aircraft Division of United Technologies Corporation for the UH-60A BLACK HAWK helicopters and the other an Air Force contract with the General Dynamics Corporation for the F-16 multimission fighter aircraft. Significant cost savings are being realized on both programs. The broadening of multiyear contracting to include requirements of all services for the same end items for spares, support equipment, and foreign military sales offers an opportunity to achieve even more cost savings than under the current contracting approach. The criteria for multiyear contracting, which include significant cost savings, stability of requirements and configuration, and confidence in contractor cost performance and capability, are found to be appropriate but vague. After several years of cost experience are accumulated, multiyear contract costs should be compared with those for prior annual contracts for the same systems in order to validate savings and to determine the extent to which engineering and requirements changes reduce them. At that time, the criterion for stability of requirements and configuration should be tightened. GRA

N85-29835# Naval Postgraduate School, Monterey, Calif.
OVERHEAD MANAGEMENT GUIDE FOR AEROSPACE PROCUREMENTS M.S. Thesis
D. D. Dietze and K. F. Walter Dec. 1984 129 p
(AD-A153626) Avail: NTIS HC A07/MF A01 CSCL 14/1

This thesis focuses on the management emphasis concerning overhead cost control. Senior personnel within the Naval Air Systems Command (NAVAIR) review a multitude of cost information. Due to the nature and complexity of these costs, it is extremely difficult to analyze and interpret cost data and, more specifically, to use these data as a basis for the management of cost control. This study will focus on overhead costs, their impact on total costs, and an analysis of management indicators deemed most useful in controlling overhead costs. Findings of the study included: administrative indicators, variance analysis, base forecasting, comparison of dollar amounts, comparison of ratios and a new tool called Overhead Cost Analysis package. GRA

N85-29836# North Atlantic Assembly, Brussels (Belgium).
SUB-COMMITTEE ON ADVANCED TECHNOLOGY AND TECHNOLOGY TRANSFER Interim Report
Nov. 1984 34 p
(AD-A153645) Avail: NTIS HC A03/MF A01 CSCL 05/4

This is the first report of the North Atlantic Assembly's Sub-Committee on Advanced Technology and Technology Transfer. The report begins with a description of the Sub-Committee's areas of interest, viz. technology transfer, high technology research, and high technology and economic growth. This report concentrates on technology transfer, describing the flow of Western technology to the Eastern bloc and how this assists the Soviet Union and its allies. The report then examines the differing views on East-West technology transfer and what effect this has on the transfer of technology between Alliance nations. Next, there is a description of the relative technological performance of the United States and the Allies. Finally, the report draws together many of the themes raised in order to formulate some specific policy proposals intended to help resolve disagreements on technology transfer. These proposals would involve reorganizing the way in which Alliance nations license high technology exports, and the creation of an Alliance technology agency both to streamline the Alliance's exploitation of technology and to harmonize exportation policies. GRA

N85-29837# Naval Postgraduate School, Monterey, Calif.
CAPITAL INVESTMENT MOTIVATIONAL TECHNIQUES USED BY PRIME CONTRACTORS ON SUBCONTRACTORS M.S. Thesis
K. S. Holtsclaw Dec. 1984 177 p
(AD-A153660; AD-E401312) Avail: NTIS HC A09/MF A01 CSCL 05/1

The current Acquisition Improvement Program (AIP) has focused a great deal of attention on many of the perceived management problems in the federal acquisition process. Included among these are the motivation of contractors to make productivity enhancing capital investments. Although this problem has been addressed previously by profit policy, the effect has been minimal. Most efforts have been directed at the prime contractor level with little effect to date. This thesis examines the complex array of factors which result in productivity enhancing capital investment and raised the question of what has been accomplished at the subcontractor level. The research, through the use of a subcontractor survey, determined that little if any effort was expended at the prime contractor level to motivate subcontractor to invest in productivity enhancing capital equipment. Until recently, subcontractors have been excluded from DOD efforts to incentivize capital investment. GRA

N85-29838# Air Force Logistics Management Center, Gunter AFS, Ala.
AUTOMATED MAINTENANCE SYSTEM TEST PROGRAM INCREMENT VI PRODUCTION SCHEDULING Final Evaluation Report
L. J. Chambers Oct. 1984 45 p
(AD-A153694; AD-F630669; AFLMC-LM760720) Avail: NTIS HC A03/MF A01 CSCL 05/9

The purpose of this report is to document evaluation results of automated production scheduling processes within the Automated Maintenance System (AMS). The processes were developed and tested at Dover AFB, Delaware. Maintenance management functions affected by AMS Increment includes scheduling and tracking of reparable parts and items requiring calibration. Workcenters affected at the time of the appraisal included all Avionics Maintenance shops, the Avionics Reparable Processing Center (RPC), and the Field Maintenance Environmental Systems Shop. This report contains the evaluation methodology, findings and recommendations for future program development. GRA

N85-29839# Air Force Logistics Management Center, Gunter AFS, Ala.
DEPLOYABLE CORE AUTOMATED MAINTENANCE SYSTEM (DCAMS)
D. M. Crippen, S. E. Alten, and J. K. Shaw Aug. 1984 17 p
(AD-A153695; AD-F630671; AFLMC-LM831215) Avail: NTIS HC A02/MF A01 CSCL 15/5

We examined hardware requirements for development of a Deployable Core Automated Maintenance System (DCAMS). Our six alternatives covered the spectrum from a mainframe computer, the Tactical Shelter System, to the Air Force standard microcomputer, Zenith Z-100. Criteria used for the evaluation looked at ease of maintenance, survivability, physical characteristics, transportability, and compatibility with CAMS. We recommend using a microcomputer network to best satisfy the hardware requirement for DCAMS. Since DCAMS is not funded, we also recommend an interim system be developed by the AFLMC to provide limited support until DCAMS is ready. The system would be developed on the AF standard microcomputer and provide engine tracking, scheduled maintenance requirements, and aircraft status information. GRA

N85-29840# Air Force Logistics Management Center, Gunter AFS, Ala.
INVENTORY POLICY FOR HIGH BACKORDER ITEMS
D. J. Blazer and C. Carter Oct. 1984 24 p
(AD-A153696; AD-F630670; AFLMC-LS840810) Avail: NTIS HC A02/MF A01 CSCL 15/5

In this study the item-by-item performance of the Standard Base Supply System (SBSS) is compared with the results of an aggregate model that minimizes backorders. We found that a small group of relatively inexpensive items generate nearly 90% of the units backordered in the SBSS in a year. By adding a lot size to the reorder point for those high backorder items, we can signifi-

cantly reduce the number of units backordered. In this study we show how to identify these items, the theory behind the proposed inventory policy change, and the stock fund impact of implementing the policy change. GRA

N85-29841# Naval Postgraduate School, Monterey, Calif.
USING INCENTIVES TO IMPROVE MAINTAINABILITY M.S. Thesis
L. Farnen, Jr. Dec. 1984 93 p
(AD-A153792) Avail: NTIS HC A05/MF A01 CSCL 05/1

The objective of this thesis was to determine if contract incentives were appropriate for use in Dept. of Defense contracts for the purpose of motivating defense contractors to improve the maintainability of weapon systems under design. To accomplish the objective it was necessary to review the components of maintainability to determine appropriate targets for the incentives and to study the concepts and issues involved in the use of incentives to motivate contractor performance. The conclusions were based in part of the responses obtained during interviews conducted with Government representatives and engineering, contracting, and corporate and program management personnel from the defense industry. In addition, the incentive program in the case of the F/A-18 aircraft was reviewed and analyzed to determine the reason for its success. GRA

N85-29842# Oak Ridge National Lab., Tenn. Computing and Telecommunications Div.
PROGRAM PLANNING USING THE GMAP PROCEDURE IN SAS/GRAPH SOFTWARE
Tommy R. Nelson, M. P. Farrell, T. J. Gross (DOE, Washington), and T. R. White 1985 11 p Presented at the SUGI/SAS Users Group Intern. Conf., Reno, Nev., 10 Mar. 1985
(Contract DE-AC05-84CR-21400)
(DE85-008356; CONF-8503114-2) Avail: NTIS HC A02/MF A01

A methodology that produces Program Planning Charts using SAS/GRAPH software was developed as an aid to program management in the CO2 Research Program of the US Department of Energy. The methodology uses programs from MAPPER, a front-end program (written by D.A. Dahl) for DISSPLA to produce Logic Flow diagrams. Each research question, or set of questions, which comprise one phase of a research propgram, is represented by a boxed area containing the title of the particular research question(s). The GMAP procedure of SAS/GRAP software reads user-supplied information regarding a variable aspect of each research question and shades the boxes accordingly. The result is a color-coded planning chart depicting the user supplied information for the individual research questions and, consequently, the status of the overall program. DOE

N85-29843# California Univ., Livermore. Lawrence Livermore Lab.
CURRENT ACTIVITIES AND BACKGROUND OF TECHNOLOGY TRANSFER AND EXCHANGE PROGRAM AT LAWRENCE LIVERMORE NATIONAL LABORATORY Annual Report
1984 38 p
(Contract W-7405-eng-48)
(DE85-009526; UCID-20357-84) Avail: NTIS HC A03/MF A01

Technology transfer activities are reported for the laser and magnetic fusion energy programs. Specific goals of the technology transfer and exchange policy are discussed. DOE

N85-29844# Politecnico di Torino (Italy). Dept. of Aerospace Engineering.
[ACTIVITIES OF THE DEPARTMENT OF AEROSPACE ENGINEERING] Annual Report, 1983
Apr. 1984 39 p refs
Avail: NTIS HC A03/MF A01

Research in aeronautics and astronautics; fluid dynamics and propulsion; structures and materials; and systems engineering and management is summarized. Wind tunnel tests on commercial aricraft models; incompressible, transonic, and supersonic flow tests; laser interactions; biomedical fluid dynamics; advanced composite aircraft structures; and aircraft instrumentation are discussed. Author (ESA)

N85-29845# Istituto Elettrotecnico Nazionale, Torino (Italy).
[ACTIVITIES OF ISTITUTO ELETTROTECNICO NAZIONALE GALILEO FERRARIS] Annual Report, 1983
1983 132 p refs
Avail: NTIS HC A07/MF A01

Research in acoustics, electromechanics, photometry systems engineering, materials science, electrical metrology, and time, frequency and electromagnetic metrology is summarized. Digital television; image processing; television satellites; and electromagnetic compatibility are discussed. Author (ESA)

N85-29846# Oesterreichisches Forschungszentrum Seibersdorf G.m.b.H., Vienna. Forschungsplanung.
[ACTIVITIES REPORT IN ENERGY TECHNOLOGY] Annual Report, 1983
Gerhard W. Schwach Dec. 1984 27 p
(OEFZS-4302; FO-30-E/84) Avail: NTIS HC A03/MF A01

Research concerning energy technology and safety; isotope and radiation techniques for materials research; measuring techniques and information processing; and environmental protection, health, and food is summarized. Author (ESA)

N85-29847# Eurosat S.A., Geneva (Switzerland).
ERS ECONOMIC IMPACE STUDY Final Report
Paris ESA 15 Jul. 1982 321 p
(Contract ESA-4692/81-F-FC(SC))
(ESA-CR(P)-1979) Avail: NTIS HC A14/MF A01

The capability of an operational European remote sensing (ERS) system to generate usable products; and the impact of these products on the economics of the most sensitive oceanic activity domains were studied. Spacecraft sensors and orbits, system configuration; ocean parameters and phenomena of relevance to users; and the processes of generating information presently used or likely to be used in oceanic activity were examined. An economic analysis, based on statistics in oceanic activity sectors applicable to the ERS-1 participating countries and to the geographical areas of relevance was performed. Maximum potential economic impact figures were modulated by the technological capability figures, and the outcome over the years 1988 to 1999 was projected using 3 different economic growth scenarios. Author (ESA)

N85-29115# Joint Publications Research Service, Arlington, Va.
US RESTRICTIONS ON TECHNOLOGY TRANSFER REVIEWED
Eberhard Wisdorff *In its* West Europe Rept.: Sci. and Technol. (JPRS-WST-84-037) 27 Nov. 1984 p 66-67 Transl. into ENGLISH from Handelsblatt (Duesseldorf), 19-20 Oct. 1984 p 2 (For primary document see N85-29108 18-31)
Avail: NTIS HC A05/MF A01

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N85-29848*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PUBLICATIONS OF THE JET PROPULSION LABORATORY 1983
15 Sep. 1984 32 p
(NASA-CR-175979; JPL-Bibliography-39-25; NAS 1.26:175979)
Avail: NTIS HC A03/MF A01 CSCL 05B

The Jet propulsion Laboratory (JPL) bibliography describes and indexes by primary author the externally distributed technical reporting, released during calendar year 1983, that resulted from

scientific and engineering work performed, or managed, by the Jet Propulsion Laboratory. Three classes of publications are included. JPL Publication (81-,82-,83-series, etc.), in which the information is complete for a specific accomplishment, articles published in the open literature, and articles from the quarterly telecommunications and Data Acquisition (TDA) Progress Report (42-series) are included. Each collection of articles in this class of publication presents a periodic survey of current accomplishments by the Deep Space Network as well as other developments in Earth-based radio technology. R.J.F.

N85-29849# Logistics Management Inst., Bethesda, Md.
IMPROVING THE DEFENSE ENERGY INFORMATION SYSTEM (DEIS)
Michael J. Konvalinka and Joan E. Longel Jan. 1985 43 p
(Contract MDA903-81-C-0166)
(AD-A153524; LMI-ML405) Avail: NTIS HC A03/MF A01 CSCL 05/2

This report provides recommendations for improvements to the Defense Energy Information System (DEIS), an automated management information system with which DOD monitors its supplies and consumption of energy. DEIS provides information about DOD's bulk petroleum products: inventory, consumption, resupply, and sale - as well as inventory and consumption of energy for utility services. The recommendations focus on the DEIS operational environment, the need for more energy management reports, and the use of microcomputers with DEIS. GRA

N85-29850# Naval Ocean Systems Center, San Diego, Calif.
DISTRIBUTED DATABASE DESIGN TOOL Final Report, May - Dec. 1984
Thomas Bentson Mar. 1985 14 p refs
(XF62582110)
(AD-A153760; NOSC/TD-783) Avail: NTIS HC A02/MF A01 CSCL 09/2

This document discusses a simulation design tool for distributed database management systems. The ability to model database transaction processing has been added to an existing communications software testbed. The information architecture used is an extension of the ANSI/SPARC standard three-schema DBMS architecture. This extended architecture was developed by the Honeywell Computer Science Center. This document discusses the standard DBMS architecture, the extended distributed DBMS architecture, the logical transaction model of database operations, and the method of simulating this logical model. Measures of data management effectiveness are also discussed. These algorithms, called global schemas and local schemas, are unique to distributed DBMSs. These govern the location, correlation, storage, retrieval, and deletion of multiple data copies. A distributed DBMS relies on the service of a communications system to transmit both control information (e.g., read or write) and data. The test and evaluation methodology allows the distributed DBMS to be modeled and tested together with the underlying communications system in order to allow these systems to be tuned to each other. GRA

N85-29851# Oak Ridge National Lab., Tenn.
INFORMATION SCIENCE IN TOXICOLOGY
P. Y. Lu and J. S. Wassom 1985 26 p refs Presented at the National Research Council Meeting, Taipei, Taiwan, 24 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-007746; CONF-8503108-1) Avail: NTIS HC A03/MF A01

Toxicology is an exciting and rapidly expanding scientific discipline, and the volume of literature being generated is growing at an exponential rate. This output reflects the current information explosion in science and technology. Generally, this large-scale increase in information began around 1960, and consequently two President's Science Advisory Committees were appointed to focus attention on the issues of information generation, compilation, and dissemination and the application of advanced computer technology in information storage and retrieval. This national policy for information development is substantiated by the fact that today online interactive retrieval of scientific and technical databases is becoming a routine process in information acquisition. Although file diversion and lack of quality control have been major problems, new approaches are resolved and these problems are examined. Author

N85-29852# Oak Ridge National Lab., Tenn. Environmental Sciences Div.
GENERIC DATA ENTRY QUALITY ASSURANCE TOOL
A. E. Rosen and P. Kanciruk 1985 10 p ref Presented at the SUGI/SAS Users Group Intern. Conf., Reno, Nev., 10 Mar. 1985
(Contract DE-AC05-84OR-21400)
(DE85-008359; CONF-8503114-1) Avail: NTIS HC A02/MF A01

COMPARE is an important SAS quality assurance tool for data base management that is especially useful when the SAS Full-Screen Product (SAS/FSP) is used for data entry. A good way to check input data for typographical errors is to have the same information entered by two different people and compare the versions for differences. This has been standard practice for data entered via keypunch machine on cards; however, it has not been as easily accomplished for data entered using SAS/FSP, via terminal, directly into SAS data sets. To facilitate this procedure, a SAS macro, COMPARE, has been developed at Oak Ridge National Laboratory, as part of the US Environmental Protection Agency's National Surface Water Survey Data Base Management Project. Data are directly and independently entered into two SAS data sets. COMPARE then automatically compares the data sets and prints out the observation number, variable name, and values for any nonmatching observations. COMPARE is generic in that it can compare values in any two identically defined SAS data sets, regardless of the number or type of variables or the number of observations. DOE

N85-29853# National Library of Medicine, Bethesda, Md. Technical Services Div.
NOTES FOR MEDICAL CATALOGERS, 1984
Apr. 1985 17 p
(PB85-180206; NLM-TSD-85-01) Avail: NTIS HC A02/MF A01 CSCL 05B

Articles and news announcements describing the cataloging policies, procedures, and bibliographic databases of the Cataloging Section of the National Library of Medicine are presented. GRA

N85-29854# National Bureau of Standards, Gaithersburg, Md. Center for Applied Mathematics.
NATIONAL ARCHIVES AND RECORDS SERVICE (NARS) TWENTY YEAR PRESERVATION PLAN
Alan Calmes (National Archives and Records Service), Ralph Schofer, and Keith R. Eberhardt 10 Jan. 1985 70 p Sponsored by National Archives and Records Service
(PB85-177640; NBSIR-85/2999) Avail: NTIS HC A04/MF A01 CSCL 05B

The purpose of this preservation plan is to identify types, extent of programs and resource requirements to bring the preservation needs of the National Archives and Records Service (NARS) to a current status of the end of twenty-two years. Data for developing the plan was derived from a scientific survey of holdings, data obtained from interviews with NARS' archivists, earlier studies and observation of operations. The recommended plan is divided into nine action categories: (1) environmental control; (2) holdings maintenance of current holdings; (3) holdings maintenance as a part of the accessioning process; (4) interception, assessment and protection at time of use; (5) systematic duplication of impermanent documents; (6) reproduction of frequently used documents; (7) laboratory treatment of intrinsically valuable documents; (8) laboratory conservation of treasures; and (9) preservation of nontextual records. Author (GRA)

N85-29855# Bolt, Beranek, and Newman, Inc., Arlington, Va.
CSIN (CHEMICAL SUBSTANCES INFORMATION NETWORK) WORKBOOK: US GEOLOGICAL SURVEY TRAINING COURSE FOR CHEMICAL SUBSTANCES INFORMATION NETWORK Final Report
Nov. 1984 229 p Sponsored by Council on Environmental

Quality
(PB85-170058; BBN-5866) Avail: NTIS HC A11/MF A01 CSCL 05B

The Chemical Substances Information Network (CSIN) is a computer interface that provides a gateway to facilitate searching and retrieving bibliographic and factual data from a large selection of online databases maintained by Dialog, SDC, NLM, BRS, OHS, CAS and CIS. The emphasis is on chemical and hydrologic information. A series of menu lead the user through setting up searches. Lists of keywords, which are tailored to specific databases, provide search terms on selected topics. This document is the complete workbook to accompany the CSIN Training Workshop developed to train end-users to use CSIN. It contains copies of all slides presented during the three day course. The topics covered include all system features, and system functions such as the editor. The examples presented are focused towards hydrological end-users. GRA

N85-29856# Battelle Pacific Northwest Labs., Richland, Wash.
NORTH AMERICAN ACID DEPOSITION DATA BASE SYSTEM (ADS) AND ITS USE IN SPATIAL ANALYSIS
C. R. Watson and A. R. Olsen Mar. 1985 20 p refs
(Contract DE-AC06-76RL-01830)
(PB85-173235; EPA-600/E-84-176) Avail: NTIS HC A02/MF A01 CSCL 05B

This presentation describes the Acid Deposition System (ADS). The system is the central database for the different monitoring efforts from several organizations in North America collecting acid rain data. The presentation depicts how data from the U.S. and Canda may be used by the acid rain scientific community. GRA

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N85-29857# Naval Ocean Research and Development Activity, Bay St. Louis, Miss.
CHEMICAL, BIOLOGICAL, AND PHYSICAL MEASUREMENTS FROM THE SUBTROPICAL WESTERN NORTH ATLANTIC OCEAN. SUMMER 1982, USNS LYNCH, CRUISE 710-82
D. A. Wiesenburg, D. F. Reid, D. M. Lavoie, and I. P. DePalma Jan. 1985 63 p
(AD-A153823; NORDA-TN-306) Avail: NTIS HC A04/MF A01 CSCL 08/1

Several years ago the Naval Ocean Research and Development Activity initiated a project to examine the interrelationships between dissolved trace gases and suspended particulate material in the upper water column of the world oceans. The goal of the project was to observe and understand the variations in biological parameters, gas distributions and suspended particulate layers to provide an assessment of in situ gas production mechanisms associated with particulate material. This report is a summary of data collected in the western North Atlantic Ocean in the summer of 1982 aboard USNS LYNCH, Cruise 710-82. Vertical profiles through most of the water column were obtained for the following parameters: conductivity, temperature, salinity, nephelometry, transmissometry, total suspended matter, dissolved and particulate organic carbon, adenosine triphosphate (ATP), chlorophyll and phaeopigments, nutrients (nitrate), nitrite, ammonium, phosphate, silicate), dissolved oxygen and dissolved reduced gases (methane and nitrous oxide). Tables of the measured and certain derived parameters are given, along with descriptions of the collection and analytical procedures. GRA

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N85-29858# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
ELECTRIC AND HYBRID VEHICLE PROGRAM: FY 1985 PROGRAM PLAN
Gary L. Hunt Feb. 1985 33 p
(Contract DE-AC07-76ID-01570)
(DE85-008933; EGG-SE-6752) Avail: NTIS HC A03/MF A01

This program plan serves as the primary management document for the INEL Electric and Hybrid Vehicle (EHV) Program. Programmatic objectives are set forth, the scope of the work is defined, and the management methodologies used to perform and control the work are presented. Programmatic interfaces and attendant responsibilities are defined. A technical plan describing the ring tests, development work and technical support activities which constitute the core of the program is provided. DOE

88 SPACE SCIENCES (GENERAL)

N85-29859*# Universities Space Research Association, Columbia, Md.
ACTIVITIES AT THE LUNAR AND PLANETARY INSTITUTE Semiannual Status Report, 1 Jul. - 31 Dec. 1984
31 May 1985 72 p refs Sponsored by NASA
(Contract NASw-3389)
(NASA-CR-175914; NAS 1.26:175914) Avail: NTIS HC A04/MF A01 CSCL 03B

The activities of the Lunar and Planetary Institute for the period July to December 1984 are discussed. Functions of its departments and projects are summarized. These include: planetary image center; library information center; computer center; production services; scientific staff; visitors program; scientific projects; conferences; workshops; seminars; publications and communications; panels, teams, committees and working groups; NASA-AMES vertical gun range (AVGR); and lunar and planetary science council. G.L.C.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

No abstracts in this category.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N85-29860*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
EVOLUTION OF THE LUMINOSITY FUNCTION OF EXTRA-GALACTIC OBJECTS
Vahe Petrosian May 1985 31 p refs Presented at the Meeting on Struct. and Evolution of Active Galactic Nuclei, Trieste, Italy; sponsored by Trieste Astronomical Observatory and the International School for Advanced Studies
(Grant NGR-05-020-668)
(NASA-CR-175977; NAS 1.26:175977; SU-CSSA-ASTRO-85-18) Avail: NTIS HC A03/MF A01 CSCL 03B

A nonparametric procedure for determination of the evolution of the luminosity function of extragalactic objects and use of this for prediction of expected redshift and luminosity distribution of objects is described. The relation between this statistical evolution of the population and their physical evolution, such as the variation with cosmological epoch of their luminosity and formation rate is presented. This procedure when applied to a sample of optically selected quasars with redshifts less than two shows that the luminosity function evolves more strongly for higher luminosities, indicating a larger quasar activity at earlier epochs and a more rapid evolution of the objects during their higher luminosity phases. It is also shown that absence of many quasars at redshifts greater than three implies slowing down of this evolution in the conventional cosmological models, perhaps indicating that this is near the epoch of the birth of the quasar (and galaxies). B.W.

N85-29861*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
ACTIVITY AND MAGNETIC FIELDS ON STARS FROM RADIO OBSERVATIONS
George A. Dulk [1983] 4 p refs Prepared in cooperation with Observatoire de Paris-Meudon
(Grant NAGw-91)
(NASA-CR-175966; NAS 1.26:175966) Avail: NTIS HC A02/MF A01 CSCL 03B

Radio observations explain certain kinds of stellar activity and reliable estimates of magnetic field strengths are derived for the radio emitting regions. Radio observation of flare stars shows rapidly varying bursts of radiation with frequencies of up to 5 GHz. The inferred brightness temperatures of these bursts (10 to the 10th power to 10 to the 14th power) imply that the radiation is coherent. Two mechanisms are proposed to generate such radiation: (1) plasma radiation, and (2) electron cyclotron masers. The high brightness temperatures of the bursts up to 10 to the 20th power K) makes the latter the most plausible. For bursts in the 5 GHz range, the magnetic field strength would be approximately 900 Gauss. F.M.R.

N85-29862# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A HIGH ENERGY X-RAY STUDY OF THE GALACTIC CENTER Final Report, 1 Oct. 1983 - 30 Apr. 1985
Frederick K. Knight Apr. 1985 2 p
(Contract N00014-84-K-0015)
(AD-A153852) Avail: NTIS HC A02/MF A01 CSCL 03/2

In this project I have studied the characteristics of the high-energy X-ray sources within 20 deg of the center of the Milky Way Galaxy. The major aim was to obtain an acceptable fit to data from the UCSD/MIT Hard X-ray and Low Energy Gamma-Ray experiment on HEAO-1. In this manner, I could study the spectra, positions and time-variability of about 25 sources. The major results of this project are the following: (1) most of the sources have steeply falling spectra as expected, (2) an intense, hard source exists within 0.5 deg of the galactic center, and it has a two-component spectrum which can be extrapolated to higher energy at the intensity of the gamma-ray continuum, which implies that this continuum is a composite of a number of sources. GRA

N85-29863# California Univ., Santa Barbara.
FORMATION OF GALAXIES
A. S. Szalay Dec. 1984 8 p refs Presented at Intern. Symp. on Phase Transitions in the Very Early Universe, Rielefeld, West Germany, 1 Jun. 1984
(Contract DE-AC02-76CH-03000)
(DE85-009537; FNAL/C-84/135) Avail: NTIS HC A02/MF A01

The present theories of galaxy formation are reviewed. The relation between peculiar velocities and the correlation function of galaxies points to the possibility that galaxies do not form uniformly everywhere. Scale invariant properties of the cluster-cluster correlations are discussed. Comparing the correlation functions in a dimensionless way, galaxies appear to be stronger clustered, in contrast with the comparison of the dimensional amplitudes of the correlation functions. Theoretical implications of several observations as Lyman-(ALPHA) clouds, correlations of faint galaxies are discussed. None of the present theories of galaxy formation can account for all facts in a natural way. DOE

N85-29864# Fermi National Accelerator Lab., Batavia, Ill. Theoretical Astrophysics.
COSMOLOGY IN THEORIES WITH EXTRA DIMENSIONS
Edward W. Kolb Jan. 1985 10 p refs Submitted for publication
Avail: NTIS HC A02/MF A01

Some possible cosmological effects of the existence of extra compact dimensions are discussed. Particular attention is given to the possibility that extra dimensions might naturally lead to an inflationary Universe scenario. DOE

N85-29865# California Univ., Berkeley. Lawrence Berkeley Lab.
AXION MASS LIMITS FROM PULSAR X-RAYS
Donald E. Morris Dec. 1984 24 p refs
(Contract DE-AC03-76SF-00098)
(DE85-010634; LBL-18690) Avail: NTIS HC A02/MF A01

Axions thermally emitted by a neutron star would be converted into X-rays in the strong magnetic field surrounding the star. An improvement in the observational upper limit of pulsed X-rays from the Vela pulsar (PSR 0833-45) by a factor 12 would constrain the axion mass M/sub a/ $<$ 2 x 10 to the -3 eV if the core is non-superfluid and at temperature T/sub c/ greater than or equal to 2 x 10 to the 8 K. If the core is superfluid throughout, an improvement factor of 240 would be needed to provide the same constraint on the axion mass, while in the absence of superfluidity, an improvement factor of 200 could constrain M/sub a/ $<$ 6 x 10 to the -4 eV. A search for modulated hard X-rays from PSR 1509-58 or other young pulsars at presently attainable sensitivities may enable the setting of an upper limit for the axion mass. Observation of hard X-rays from a very young hot pulsar with T/sub c/greater than or equal to 7 x 10 to the 8 K could set a firm bound on the axion mass, since neutron superfluidity is not expected above this temperature. The remaining axion mass range 6 x 10 to the -4 eV $>$ M sub A $>$ 10 to the -5 eV (the cosmological lower bound) can be covered by an improved Sikivie type laboratory cavity detector for relic axions constituting the galactic halo. DOE

N85-29866# Rome Univ. (Italy). Dipt. di Fisica.
SOME FEATURES OF THE INTERPLANETARY MEDIUM DURING FORBUSH DECREASES
N. Iucci, M. Parisi, M. Storini, and G. Villoresi 16 Nov. 1984 8 p refs Presented at Intern. Symp. on Cosmic Ray Modulation in the Heliosphere, Morioka, Japan, 21-25 Aug. 1984
(NOTA-INTERNA-836) Avail: NTIS HC A02/MF A01

Observational evidence for a Forbush decrease (Fd) model in which a strong perturbation, originating from an energetic type 4 solar flare and propagating into the interplanetary space is the origin of Fds is discussed. This perturbation is bordered ahead by a shock which marks the front boundary of the modulated region. The lateral boundaries of the modulated region are located close to two perturbations which recur for several solar rotations. As the frontal perturbation propagates into interplanetary space, the modulated region between the two boundary streams rotates westward with the Sun; so the Fd effect is also observed in interplanetary regions not swept by the frontal perturbation. Flares not associated with Fd are produced by type 4 activity on the back side of the Sun. Author (ESA)

N85-29867# Rome Univ. (Italy). Dipt. di Fisica.
DID BOSONIC SNEUTRINO STARS EVER EXIST
Daniele Fargion 14 Oct. 1984 21 p refs
(PREPRINT-421) Avail: NTIS HC A02/MF A01

The existence and evolution of sneutrino stars is considered. Degenerated bosonic sneutrino stars and corresponding sneutrino mini black holes cannot be at present a relevant component of the Universe. Their total mass density must not exceed 10 to the minus 7th power of the critical mass. However their Hawking evaporation at redshift Z = 2 might rule the quasar X-gamma luminosity and lead to Ostriker-Cowie pregalactic explosions.
Author (ESA)

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N85-29868 Institut d'Aeronomie Spatiale de Belgique, Brussels.
THE INFLUENCE OF GLOBAL DUST STORMS ON THE MEAN SEASONAL DAILY INSOLATIONS AT THE MARTIAN SURFACE
E. vanHemelrijck 1984 18 p refs Submitted for publication
(Aeronomica-Acta-A-289-1984) Avail: Issuing Activity

Changes in the mean seasonal daily insolations at the Martian surface caused by global dust storms characterized by various atmospheric optical thickness are compared. The calculations, made for optical depths equal to 0, 0.1, 0.5, 1.0, 2.0, and 3.0, are based on the assumption of planet encircling storms lasting 1 season or 1 yr. The variations in the latitudinal and seasonal surface insolation distributions are important, mainly at the poles where, e.g., the mean annual and summer daily insolations decrease by a factor of 3000 as optical depth goes from 0 to 3.0. At equatorial latitudes the corresponding loss is much smaller, reaching a value of 40. The decrease in mean wintertime solar radiations is even more spectacular, especially at high latitudes.
Author (ESA)

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N85-29869*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MEASUREMENTS OF SOLAR VECTOR MAGNETIC FIELDS
Mona J. Hagyard, ed. Washington May 1985 477 p refs Conf. held in Huntsville, Ala., 15-18 May 1984; sponsored by NASA, Alabama Univ., and NOAA Original contains color illustrations
(NASA-CP-2374; M-484; NAS 1.55:2374) Avail: NTIS HC A21/MF A01 CSCL 03B

Various aspects of the measurement of solar magnetic fields are presented. The four major subdivisions of the study are: (1) theoretical understanding of solar vector magnetic fields; (3) techniques for interpretation of observational data; and (4) techniques for data display. For individual titles, see N85-29870 through N85-29904.

N85-29870*# Chicago Univ., Ill. Dept. of Physics.
THE VECTOR STRUCTURE OF ACTIVE MAGNETIC FIELDS
Eugene N. Parker *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 7-16 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

Observations are needed to show the form of the strains introduced into the fields above the surface of the Sun. The longitudinal component alone does not provide the basic information, so that it has been necessary in the past to use the filamentary structure observed in H sub alpha to supplement the longitudinal information. Vector measurements provide the additional essential information to determine the strains, with the filamentary structure available as a check for consistency. It is to be expected, then, that vector measurements will permit a direct mapping of the strains imposed on the magnetic fields of active regions. It will be interesting to study the relation of those strains to the emergence of magnetic flux, flares, eruptive prominences, etc. In particular we may hope to study the relaxation of the strains via the dynamical nonequilibrium.
Author

N85-29871*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ON THE NUMERICAL COMPUTATION OF NONLINEAR FORCE-FREE MAGNETIC FIELDS c64
S. T. Wu (Alabama Univ., Huntsville), H. M. Chang (Alabama Univ., Huntsville), and Mona J. Hagyard *In its* Meas. of Solar Vector Magnetic Fields May 1985 p 17-48 refs (For primary document see N85-29869 18-92)
(Contract NAS8-33525; Grant NAGw-9; Contract F19628-83-K-0019)
Avail: NTIS HC A21/MF A01 CSCL 12A

An algorithm has been developed to extrapolate nonlinear force-free magnetic fields from a source surface, given the proper boundary conditions. The results of this work; describing the mathematical formalism that was developed, the numerical techniques employed, and the stability criteria developed for these numerical schemes are presented. An analytical solution is used for a test case; the results show that the computational accuracy for the case of a nonlinear force-free magnetic field was on the order of a few percent (< 5%).
Author

N85-29872*# High Altitude Observatory, Boulder, Colo.
MODELING SOLAR MAGNETIC STRUCTURES
Boon Chye Low *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 49-65 refs Sponsored by NSF (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

Some ideas in the theoretical study of force-free magnetic fields and magnetostatic fields, which are relevant to the effort of using magnetograph data as inputs to model the quasi-static, large-scale magnetic structures in the solar atmosphere are discussed. Basic physical principles will be emphasized. An attempt will be made to assess what we may learn, physically, from the models based on these ideas. There is prospect for learning useful physics and this ought to be an incentive for intensifying the efforts to improve vector magnetograph technology and to solve the basic radiative-transfer problems encountered in the interpretation of magnetograph raw data.
Author

N85-29873*# Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Science.
MAGNETIC AND THERMODYNAMIC STRUCTURE OF THE SOLAR CORONA DURING SUNSPOT MINIMUM
Vladimir A. Osherovich, Israel Tzur (National Center for Atmospheric Research), and Erast B. Gliner (Washington Univ., St. Louis) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 66-77 refs Prepared in cooperation with NOAA, Boulder, Colo. (For primary document see N85-29869 18-92)
(NASA Order W-15028; Grants NSF PHY-81-15800; NSF PHY-83-13545)
Avail: NTIS HC A21/MF A01 CSCL 03B

A model of the solar corona during sunspot minimum was constructed. It was suggested that pole-equator asymmetry is caused by interaction of global azimuthal electric currents in the corona and potential magnetic fields originating below the corona. The problem was reduced to a nonlinear ordinary differential equation for a structural function. Taking the difference in electron density between the equatorial plane and the polar direction from observations, the basic equation was solved and

the global electric current distribution around the Sun along with the magnetic and thermodynamic structures of the solar corona was derived. The asymmetry between the two hemispheres, which can be due to the magnetic quadrupole, is considered in detail. It is shown that an additional quadrupole term in the magnetic field representation affects the position of polar coronal hole boundaries differently in the two hemispheres. As a result, the outflow from the two polar regions is found to be different. Author

N85-29874*# Chiba Inst. of Tech., Narashino (Japan).
THEORETICAL APPROACH TO EVOLUTION OF SOLAR MAGNETIC FIELD
Yoshinari Nakagawa *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 78-85 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

Theoretical approaches to the evolution of solar atmosphere magnetic field are briefly reviewed from the standpoint of the physical significance. A new direction of analysis based on the possible manners of generation of electric current is considered, and its physical implications are discussed. Author

N85-29875*# New Hampshire Univ., Durham.
CURRENT EVOLUTION IN A NUMERICAL EMERGING-MAGNETIC-FLUX MODEL
Terry Forbes *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 86-100 refs (For primary document see N85-29869 18-92)
(Grant NAGw-76)
Avail: NTIS HC A21/MF A01 CSCL 03B

The resistive-MHD equations are numerically solved in two-dimensions for an initial-boundary-value problem which models the emergence of magnetic flux from the photosphere into the corona. As the emergence begins a current sheet forms around the emerging region which separates the emerging region from the overlying coronal magnetic field. This current sheet is the source of the free-magnetic energy in the system, and in the limit of zero resistivity it is a simple tangential discontinuity. However, when the resistivity is finite, reconnection between the magnetic field in the emerging region and the overlying coronal magnetic field ensures, and the subsequent evolution of the enveloping current sheet becomes complex. The overall time history of the current evolution is suggestive of the expected current evolution for the pre-flare, impulsive, and main phases of flares. Author

N85-29876*# Max-Planck-Inst. fuer Physik und Astrophysik, Garching (West Germany). Inst. fuer Astrophysik.
THE GLOBAL STRUCTURE OF MAGNETIC FIELDS WHICH SUPPORT QUIESCENT PROMINENCES
Ulrich Anzer *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 101-106 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

Magnetic fields in quiescent prominences were observed, but only recently has it become possible to measure the full magnetic field vector. The component of the field along the line of sight, B (parallel) can be uniquely determined, whereas for the component perpendicular to the line of sight B (perpendicular) and -B (perpendicular) are indistinguishable. An ambiguity remains in the actual magnetic field vector, in particular with respect to its orientation relative to the prominence axis. A sample of more than 100 prominences were studied. A more detailed analysis of 10 prominences are presented, and then set these prominence fields into relation to the underlying photospheric fields. It is found from statistical analysis of several hundred prominences that in 25% of the cases the field penetrates the prominence directly, whereas in 75% the field orientation in the prominence is reversed. DOE

N85-29877*# Kitt Peak National Observatory, Tucson, Ariz. National Solar Observatory.
TRENDS IN MEASUREMENT OF SOLAR VECTOR MAGNETIC FIELDS USING THE ZEEMAN EFFECT
John W. Harvey *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 109-120 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

Trends in spectropolarimetry as applied to the problem of Zeeman effect measurement are discussed. The use of detector arrays to improve observing efficiency is obtained. Which required new polarization modulation schemes that match the time required to read detector arrays. Another significant trend is narrowband filters, to improve angular and temporal coverage, and to Fourier transform spectrometers, to improve spectral coverage and precision. Low-polarization designs and improved methods for compensating instrumental polarization were developed. A requirement for high angular resolution suggests using adaptive optical devices to subdue the effects of bad seeing. The ultimate strategy to beat the seeing is to loft the telescope above the atmosphere such as is planned with a 30-cm telescope in 1985 and a 1250-cm telescope in 1990. E.A.K.

N85-29878*# Observatoire du Pic-du-Midi, Bagneres de Bigorre (France).
THE HANLE EFFECT APPLIED TO MAGNETIC FIELD MEASUREMENTS
J. L. Leroy *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 121-140 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

The Hanle effect is the modification by a local magnetic field of the polarization due to coherent scattering in spectral lines. It results from the precession of a classical oscillator about the magnetic field direction. The sophisticated quantum-mechanical treatment, which is required to compute the polarization parameters of scattered light, was developed. The main features of the Hanle effect concerning magnetic field measurements are: (1) a good sensitivity within the approximate range 0.1 B gamma rho to 10 B gamma rho where B gamma rho is the field strength yielding a Larmor period equal to the radiative lifetime, (2) there is no Hanle effect for field vectors parallel to the excitating beam, (3) the Hanle effect refers essentially to the linear polarization in a spectral line, (4) various points in the line profile are affected in the same way by change of linear polarization so that polarization parameters can be measured on the integrated line profile. E.A.K.

N85-29879*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
SOME DESIGN CONSIDERATIONS FOR A SATELLITE-BORNE MAGNETOGRAPH **c35**
David M. Rust *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 141-152 refs (For primary document see N85-29869 18-92)
(Grant NAGw-522)
Avail: NTIS HC A21/MF A01 CSCL 14C

The design criteria for a compact magnetograph that can monitor solar magnetic fields from a free-flying satellite for 5 to 10 years are reviewed. The signal-to-noise ratio that can be obtained with a 10-cm f/10 refractor operated with a Fabry-Perot filter and a solid-state detector array is derived. The telescope measures the longitudinal component of the magnetic field for the entire solar disk in a few minutes at a 20-G threshold and at 3-arcsec resolution. The Fabry-Perot filter has a lithium niobate etalon, which can be tuned electrically and operated at a fixed tilt angle in such a manner that it cancels the solar rotational Doppler shifts in the transmitted spectrum. Principles of operation of various types of polarization modulators are presented, and it is concluded that photoelastic modulators and liquid-crystal devices hold the most promise for use in a satellite-borne magnetograph, E.A.K.

N85-29880*# Goettingen Univ. (West Germany).
MEASUREMENTS OF VECTOR FIELDS WITH DIODE ARRAY **c35**
Eberhard J. Wiehr and W. Scholiers (Inst. d'Astrophysique, Brussels) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 153-159 refs (For

primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

A polarimeter was designed for high spatial and spectral resolution. It consists of a quarter-wave plate alternately operating in two positions for Stoke-V measurements and an additional quarter-wave plate for Stokes-U and -Q measurements. The spatial range covers 75 arcsec, the spectral window of about 1.8 a allows the simultaneous observations of neighboring lines. The block diagram of the data processing and acquisition system consists of five memories each one having a capacity of 10 to the 4th power 16-bit words. The total time to acquire profiles of Stokes parameters can be chosen by selecting the number of successive measurements added in the memories, each individual measurement corresponding to an integration time of 0.5 sec. Typical values range between 2 and 60 sec depending on the brightness of the structure, the amount of polarization and a compromise between desired signal-to-noise ratio and spatial resolution. E.A.K.

N85-29881*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ANALYSIS OF THE NEW POLARIMETER FOR THE MARSHALL SPACE FLIGHT CENTER VECTOR MAGNETOGRAPH c35
E. A. West *In its* Meas. of Solar Vector Magnetic Fields May 1985 p 160-172 ref (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

The magnetograph was upgraded in both electronic control of the magnetograph hardware and in the polarization optics. The problems associated with the orignal polarimeter were: (1) field of view errors associated with the natural birefringence of the KD*P crystals; (2.) KD*P electrode failure due to the halfwave dc voltage required in one of the operational sequences; and (3) breakdown of the retardation properties of some KD*Ps when exposed to a zero to halfwave modulation (DC) scheme. The new polarimeter gives up the flexibility provided by two variable waveplates to adjust the retardances of the optics for a particular polarization measurement, but solves the problems associated with the original polarimeter. With the addition of the quartz quarterwave plates, a new optical alignment was developed to allow the remaining KD*P to correct for errors in the waveplates. The new optical alignment of the polarimeter is prescribed. The various sources of error, and how those errors are minimized so that the magnetograph can look at the transverse field in real time are discussed. E.A.K.

N85-29882*# Tokyo Astronomical Observatory (Japan).
THE SOLAR VECTOR MAGNETOGRAPH OF THE OKAYAMA ASTROPHYSICAL OBSERVATORY c35
Mitsugu Makita, Shigeo Hamana, and Keizo Nishi *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 173-182 refs Original contains color illustrations (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

The vector magnetograph of the Okayama Astrophysical Observatory is fed to the 65 cm solar coude telescope with a 10 m Littrow spectrograph. The polarimeter put at the telescope focus analyzes the incident polarization. Photomultipliers (PMT) at the exit of the spectrograph pick up the modulated light signals and send them to the electronic controller. The controller analyzes frequency and phase of the signal. The analyzer of the polarimeter is a combination of a single wave plate rotating at 40 Hz and a Wallaston prism. Incident linear and circular polarizations are modified at four times and twice the rotation frequency, respectively. Two compensators minimize the instrumental polarization, mainly caused by the two tilt mirrors in the optical path of the telescope. The four photomultipliers placed on the wings of the FeI 5250A line give maps of intensity, longitudinal field and transverse field. The main outputs, maps of intensity, and net linear and circular polarizations in the neighboring continuum are obtained by the other two monitor PMTs. E.A.K.

N85-29883*# Hawaii Univ., Kula. Inst. for Astronomy.
VECTOR MAGNETIC FIELD OBSERVATIONS WITH THE HALEAKALA POLARIMETER c35
D. L. Mickey *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 183-191 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

Several enhancements were recently made to the Haleakala polarimeter. Linear array detectors provide simultaneous resolution over a 3-A wavelength range, with spectral resolution of 40 mA. Optical fibers are now used to carry the intensity-modulated light from the rotating quarter-wave plate polarimeter to the echelle spectrometer, permitting its removal from the spar to a more stable environment. These changes, together with improved quarter-wave plates, reduced systematic errors to a few parts in 10,000 for routine observations. Examples of Stokes profiles and derived magnetic field maps are presented. R.J.F.

N85-29884*# Observatoire de Paris-Meudon (France).
STOKES PARAMETERS MODULATOR FOR BIREFRINGENT FILTERS c35
Audouin Dollfus *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 192-201 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

The Solar Birefringent Filter (Filter Polarisiant Solaire Selectif FPSS) of Meudon Observatory is presently located at the focus of a solar refractor with a 28 cm lens directly pointed at the Sun. It produces a diffraction limited image without instrumental polarization and with a spectral resolution of 46,000 in a field of 6 arc min. diameter. The instrument is calibrated for absolute Doppler velocity measurements and is presently used for quantitative imagery of the radial velocity motions in the photosphere. The short period oscillations are recorded. Work of adapting the instrument for the imagery of the solar surface in the Stokes parameters is discussed. The first polarizer of the birefringent filter, with a reference position angle 0 deg, is associated with a fixed quarter wave plate at +45 deg. A rotating quarter wave plate is set at 0 deg and can be turned by incremented steps of exactly +45 deg. Another quarter wave plate also initially set at 0 deg is simultaneously incremented by -45 deg but only on each even step of the first plate. A complete cycle of increments produces images for each of the 6 parameters I + or - Q, I + or - U and I + or - V. These images are then subtracted by pairs to produce a full image in the three Stokes parameters Q, U and V. With proper retardation tolerance and positioning accuracy of the quarter wave plates, the cross talk between the Stokes parameters was calculated and checked to be minimal. R.J.F.

N85-29885*# California State Univ., Northridge. Dept. of Physics and Astronomy.
THE SAN FERNANDO OBSERVATORY VIDEO STOKES POLARIMETER c35
Paul H. Richter, Louis K. Zeldin, and Timothy A. Loftin *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 202-218 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

A study was conducted to determine the suitability of the San Fernando Observatory's 61 cm (24 inch) aperture vacuum solar telescope and 3 m (118 inch) focal length vacuum spectroheliograph for Stokes Polarimetry measurements. The polarization characteristics of these two instruments was measured by determining their Mueller matrices as a function of telescope orientation, field angle, wavelength, grating type, and position of the measuring beam in the telescope entrance window. In general, the polarizing and depolarizing properties are small so that inversion of the system Mueller matrix will permit the accurate measurement of Stokes profiles for vector magnetic field determination. A proposed polarimeter design based on the use of a TV camera system to simultaneously scan six different polarization components of a given line profile is described. This design, which uses no rotating optics or electronic modulators and makes efficient use of the available irradiance, promises to yield high quality vector magnetograms. Author

N85-29886*# Observatoire de Paris-Meudon (France).
THE NEW SOLAR MAGNETOGRAPH FOR THE CANARY ISLANDS OBSERVATORY THEMIS **c35**
J. Rayrole *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 219-230 (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

THEMIS was designed for accurate polarization measurements in order to determine the intensity and direction of the magnetic field without interference with the local variations of the thermodynamical parameters. That goal leads to the following requirements: (1) high spatial resolution in horizontal direction; (2) sufficient resolution in height, which requires observations in several spectral lines with a sufficient spectral resolution; (3) accurate polarization measurements; (4) adequate time coverage to follow the evolution of individual structures; (5) precise tracking and scanning mechanisms; and (6) sufficient field of view for the different observed structures. The design of the instrument is discussed in detail. R.J.F.

N85-29887*# Academy of Sciences (USSR), Irkutsk. Inst. of Terrestrial Magnetism, Ionosphere and Radio Wave Propagation.
THE VECTOR MAGNETOGRAPH OF THE SAYAN SOLAR OBSERVATORY **c35**
V. M. Grigoryev, N. I. Kobanov, B. F. Osak, V. L. Selivanov, and V. E. Stepanov *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 231-256 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

The problem of choosing an optimum scheme for the electrooptical analyzer of polarization and related control principles are discussed. An electrooptical deflector, which is advantageously used to employ a single photodetector and to remove systematic errors inherent in magnetographs with two photodetectors in the wings of the line is discussed, as well as adjustment errors of optical elements of the polarization analyzer and errors of control voltages. A method for measuring the telescope's polarization matrix, reduction of magnetographic measurements for instrumental polarization and calibration of magnetograph channels are examined. Questions of evaluating scattered light and of reducing magnetic field measurements are also considered as a computational procedure for the magnetic field vector parameters is briefly outlined. Computer control of the solar magnetograph and of the processing and control system software is discussed. R.J.F.

N85-29888*# Academia Sinica, Peking (China).
MULTICHANNEL BIREFRINGENT FILTER **c35**
Ai Gouxiang and Hu Huefeng *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 257-259 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 14C

A birefringent filter with a large field of view and no additional polarization is discussed. It plays an important role in observing the solar monochromatic image and the solar vector magnetic field. It has only one channel. For simultaneous multichannel observations, the solar spectrograph is better than the birefringent filter. A suggestion was proposed to try to obtain a multichannel birefringent filter which will be used in a new telescope at the Huairou reservoir station of Beijing Observatory. By means of N polarizing beam splitters, (N+1) channels can be divided. In principle, any number of limitless channels can be obtained, thereby subdividing the whole solar spectrum. But since the space in a telescope is limited, the channels to be used are also limited. For the new telescope, 5 and 9 channels are being considered, and the spectral range is from lambda 3800A to lambda 7000A. Many lines are included in this range, for example, H, K, H beta, lambda lambda 5324A, 5250A, 6302A, H alpha, etc., and some of the lines are suited to measure solar velocity fields. According to the character of these lines, the half width of each channel is determined. Moreover, in some channels the solid polarizing Michelson interferometer is considered for measuring velocity field with a lm/s accuracy. The advantages of the filter and problems to be solved are listed. R.J.F.

N85-29889*# Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Astronomy.
DIAGNOSTICS OF VECTOR MAGNETIC FIELDS
Jan O. Stenflo *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 263-278 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

It is shown that the vector magnetic fields derived from observations with a filter magnetograph will be severely distorted if the spatially unresolved magnetic structure is not properly accounted for. Thus the apparent vector field will appear much more horizontal than it really is, but this distortion is strongly dependent on the area factor and the temperature line weakenings. As the available fluxtube models are not sufficiently well determined, it is not possible to correct the filter magnetograph observations for these effects in a reliable way, although a crude correction is of course much better than no correction at all. The solution to this diagnostic problem is to observe simultaneously in suitable combinations of spectral lines, and/or use Stokes line profiles recorded with very high spectral resolution. The diagnostic power of using a Fourier transform spectrometer for polarimetry is shown and some results from I and V spectra are illustrated. The line asymmetries caused by mass motions inside the fluxtubes adds an extra complication to the diagnostic problem, in particular as there are indications that the motions are nonstationary in nature. The temperature structure appears to be a function of fluxtube diameter, as a clear difference between plage and network fluxtubes was revealed. The divergence of the magnetic field with height plays an essential role in the explanation of the Stokes V asymmetries (in combination with the mass motions). A self consistent treatment of the subarcsec field geometry may be required to allow an accurate derivation of the spatially averaged vector magnetic field from spectrally resolved data. R.J.F.

N85-29890*# Florence Univ. (Italy). Ist. di Astronomia.
GENERATION AND TRANSFER OF POLARIZED RADIATION IN THE SOLAR ATMOSPHERE: PHYSICAL MECHANISMS AND MAGNETIC-FIELD DIAGNOSTICS
E. Landi DegliInnocenti *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 279-299 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

The main physical mechanisms responsible for the generation and transfer of polarized radiation in the solar atmosphere can be classified in a suitable bidimensional diagram with an indicator of the magnetic field strength on its vertical axis and an indicator of the radiation field anisotropy on its horizontal axis. The various polarimetric observations performed on solar spectral lines are interpreted with different theoretical schemes according to their classification in the diagram and to the optical depths involved. These theoretical schemes, and the associated diagnostic tools for inferring the magnetic field vector from observations are reviewed. In particular, the role of magneto-optical effects in determining the direction of the observed linear polarization in active regions is discussed in some detail. Author

N85-29891*# Observatoire de Paris-Meudon (France).
DYNAMIC MODELS OF FLUX TUBES IN THE INTERPRETATION OF POLARIZATION MEASUREMENTS
E. Ribes-Nesme, David E. Rees (Sydney Univ., Australia), and Fang Cheng (Nanjing Univ., China) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 300-305 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

Recent observations of Stokes parameter profiles indicate the presence of mass motions with large velocity gradients associated with small-scale magnetic elements. Dynamic models of flux tubes were used in order to interpret observations of unresolved elements. It is clear that the physical picture of the dynamic models will be quite different from the hydrostatic ones since there is a strong coupling between the magnetic and the velocity field. Polarization measurements have to be interpreted in terms of dynamic models. Two-D steady flow solutions in slender magnetic

tubes have been worked out. It was found that the main properties of the intensity line profiles as well as the asymmetries of the V Stokes profiles can be explained best in terms of magnetic elements with moderate field strength. B.W.

N85-29892*# High Altitude Observatory, Boulder, Colo.
LEAST SQUARES INVERSION OF STOKES PROFILES IN THE PRESENCE OF VELOCITY GRADIENTS
A. Skumanich, David E. Rees (Sydney Univ., Australia), and Bruce W. Lites (Sacramento Peak Observatory, Sunspot, N. Mex.) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 306-321 refs (For primary document see N85-29869 18-92)
(Grant NSF AST-78-17292)
Avail: NTIS HC A21/MF A01 CSCL 03B

The Auer, Heasley and House Stokes inversion procedure in use at High Altitude Observatory is based on the analytic solution of the equation of transfer for polarized light where the representation of the thermodynamic and magnetic structure of the atmosphere is assumed to have a high degree of invariance, namely, a Milne-Eddington (ME) structure with a constant magnetic field. In the presence of invariance breaking gradients the resultant Stokes profiles are represented only approximately, if at all, by analytic forms. The accuracy of the inversion parameters and their significance as measures of actual structure are explored for the ME and the Landman-Finn sunspot models under the effects of velocity gradients. The resulting field parameters are good to a few percent and prove to be insensitive to the errors committed by the use of a ME-representation, but the resulting ME parameters yield a less precise measure of thermal structure. B.W.

N85-29893*# Lockheed Missiles and Space Co., Palo Alto, Calif.
CONTRIBUTION FUNCTIONS FOR ZEEMAN-SPLIT LINES, AND LINE FORMATION IN PHOTOSPHERIC FACULAE
A. A. vanBallegooijen *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 322-334 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

The transfer of polarized light in an inhomogeneous stellar atmosphere, and the formation of magnetically sensitive spectral lines, are discussed. A new method for the solution of the transfer equations is proposed. The method gives a natural definition of the contribution functions for Stokes' parameters, i.e., functions describing the contributions from different parts along the line-of-sight (LOS). The formalism includes all magneto-optical effects, and allows for an arbitrary variation of magnetic field, velocity field, temperature, density, etc., along the LOS. The formation of FeI lambda 5250.2 in photospheric faculae is described. A potential-field model of a facular element is presented, and spectra profiles and contribution functions are computed for the Stokes parameters I, Q, and V. B.W.

N85-29894*# Observatoire de Paris-Meudon (France).
EFFECT OF POLARIZED RADIATIVE TRANSFER ON THE HANLE MAGNETIC FIELD DETERMINATION IN PROMINENCES: ANALYSIS OF HYDROGEN H ALPHA LINE OBSERVATIONS AT PIC-DU-MIDI
Veronique Bommier, E. Landi Degl'Innocenti (Florence Univ.), J. L. Leroy (Observatoire du Pic-du-Midi), and S. Sahal-Brechot *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 335-340 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

The linear polarization of the Hydrogen H alpha line of prominences has been computed, taking into account the effect of a magnetic field (Hanle effect), of the radiative transfer in the prominence, and of the depolarization due to collisions with the surrounding electrons and protons. The corresponding formalisms are developed in a forthcoming series of papers. In this paper, the main features of the computation method are summarized. The results of computation have been used for interpretation in terms of magnetic field vector measurements from H alpha polarimetric observations in prominences performed at Pic-du-Midi coronagraph-polarimeter. Simultaneous observations in one optically thin line (He I D(3)) and one optically thick line (H alpha) give an opportunity for solving the ambiguity on the field vector determination. Author

N85-29895*# High Altitude Observatory, Boulder, Colo.
THE EFFECT OF LINE DAMPING, MAGNETO-OPTICS AND PARASITIC LIGHT ON THE DERIVATION OF SUNSPOT VECTOR MAGNETIC FIELDS
A. Skumanich and Bruce W. Lites (Sacramento Peak Observatory, Sunspot, N. Mex.) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 341 Sponsored by NSF (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

The least square fitting of Stokes observations of sunspots using a Milne-Eddington-Unno model appears to lead, in many circumstances, to various inconsistencies such as anomalously large doppler widths and, hence, small magnetic fields which are significantly below those inferred solely from the Zeeman splitting in the intensity profile. It is found that the introduction of additional physics into the model such as the inclusion of damping wings and magneto-optic birefrigence significantly improves the fit to Stokes parameters. Model fits excluding the intensity profile, i.e., of both magnitude as well as spectral shape of the polarization parameters alone, suggest that parasitic light in the intensity profile may also be a source of inconsistencies. The consequences of the physical changes on the vector properties of the field derived from the Fe I lambda 6173 line for the 17 November 1975 spot as well as on the thermodynamic state are discussed. A Doppler width delta lambda (D) - 25mA is bound to be consistent with a low spot temperature and microturbulence, and a damping constant of a = 0.2. B.W.

N85-29896*# Sacramento Peak Observatory, Sunspot, N. Mex. National Solar Observatory.
THE INFERENCE OF VECTOR MAGNETIC FIELDS FROM POLARIZATION MEASUREMENTS WITH LIMITED SPECTRAL RESOLUTION
Bruce W. Lites and Andrew Skumanich (High Altitude Observatory, Boulder, Colo.) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 342-367 refs (For primary document see N85-29869 18-92)
(Grant NSF AST-78-17292)
Avail: NTIS HC A21/MF A01 CSCL 03B

A method is presented for recovery of the vector magnetic field and thermodynamic parameters from polarization measurement of photospheric line profiles measured with filtergraphs. The method includes magneto-optic effects and may be utilized on data sampled at arbitrary wavelengths within the line profile. The accuracy of this method is explored through inversion of synthetic Stokes profiles subjected to varying levels of random noise, instrumental wave-length resolution, and line profile sampling. The level of error introduced by the systematic effect of profile sampling over a finite fraction of the 5 minute oscillation cycle is also investigated. The results presented here are intended to guide instrumental design and observational procedure. B.W.

N85-29897*# Academia Sinica, Nanking (China).
SOLAR MONOCHROMATIC IMAGES IN MAGNETO-SENSITIVE SPECTRAL LINES AND MAPS OF VECTOR MAGNETIC FIELDS
Ye Shihui, Jin Jiehai, and Jiang Minhan *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 368-374 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

A new method which allows by use of the monochromatic images in some magneto-sensitive spectra line to derive both the magnetic field strength as well as the angle between magnetic field lines and line of sight for various places in solar active regions is described. In this way two dimensional maps of vector magnetic fields may be constructed. This method was applied to some observational material and reasonable results were obtained. In

addition, a project for constructing the three dimensional maps of vector magnetic fields was worked out. Author

N85-29898*# Observatoire de Paris-Meudon (France).
MAGNETIC FIELD-VECTOR MEASUREMENTS IN QUIESCENT PROMINENCES VIA THE HANLE EFFECT: ANALYSIS OF PROMINENCES OBSERVED AT PIC-DU-MIDI AND AT SACRAMENTO PEAK
Veronique Bommier, J. L. Leroy (Observatoire du Pic-du-Midi), and S. Sahal-Brechot *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 375-378 refs (For primary document see N85-29869 18-92)
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The Hanle effect method for magnetic field vector diagnostics has now provided results on the magnetic field strength and direction in quiescent prominences, from linear polarization measurements in the He I E sub 3 line, performed at the Pic-du-Midi and at Sacramento Peak. However, there is an inescapable ambiguity in the field vector determination: each polarization measurement provides two field vector solutions symmetrical with respect to the line-of-sight. A statistical analysis capable of solving this ambiguity was applied to the large sample of prominences observed at the Pic-du-Midi (Leroy, et al., 1984); the same method of analysis applied to the prominences observed at Sacramento Peak (Athay, et al., 1983) provides results in agreement on the most probable magnetic structure of prominences; these results are detailed. The statistical results were confirmed on favorable individual cases: for 15 prominences observed at Pic-du-Midi, the two-field vectors are pointing on the same side of the prominence, and the alpha angles are large enough with respect to the measurements and interpretation inaccuracies, so that the field polarity is derived without any ambiguity. Author

N85-29899*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INFERRED FLOWS OF ELECTRIC CURRENTS IN SOLAR ACTIVE REGIONS
Y. J. Ding (Academia Sinica, Kunming), Q. F. Hong (Academia Sinica Kunming), Mona J. Hagyard, and A. C. DeLoach *In its* Meas. of Solar Vector Magnetic Fields May 1985 p 379-398 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

Techniques to identify sources of major current systems in active regions and their channels of flow are explored. Measured photospheric vector magnetic fields together with high resolution white light and H-alpha photographs provide the data base to derive the current systems in the photosphere and chromosphere of a solar active region. Simple mathematical constructions of active region fields and currents are used to interpret these data under the assumptions that the fields in the lower atmosphere (below 200 km) may not be force free but those in the chromosphere and higher are. The results obtained for the complex active region AR 2372 are: (1) Spots exhibiting significant spiral structure in the penumbral filaments were the source of vertical currents at the photospheric surface; (2) Magnetic neutral lines where the transverse magnetic field was strongly sheared were channels along which a strong current system flowed; (3) The inferred current systems produced a neutral sheet and oppositely-flowing currents in the area of the magnetic delta configuration that was the site of flaring. Author

N85-29900*# Tokyo Astronomical Observatory, Mitaka (Japan).
COMPARISONS OF SIMULTANEOUS VECTOR MAGNETOGRAMS
Mitsugu Makita, K. Nishi, M. Shimizu, S. Hamana, T. Sakura (Tokyo Univ.), V. M. Grigoryev (Academy of Sciences (USSR), Irkutsk), G. V. Kuklin (Academy of Sciences (USSR), Irkutsk), and V. L. Selivanov (Academy of Sciences (USSR), Irkutsk) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 399-402 refs (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

Simultaneous vector magnetograms were obtained with the different magnetographs of the Okayama Astrophysical Observatory and the Sayan Mountain Observatory in October 1983. The data obtained show a good correspondence in general. The comparison makes clear something on the measuring accuracy of each magnetograph. Good correspondence is shown in circular and linear polarizations, and, in and near sunspots, of the velocity field. The azimuth of the magnetic fields show good agreement. Author

N85-29901*# Hale Observatories, Pasadena, Calif.
EPHEMERAL REGIONS VERSUS PSEUDO EPHEMERAL REGIONS
S. F. Martin, S. H. B. Livi (Univ. Federal do Rio Grande do Sul), J. Wang (Academia Sinica, Peking), and Z. Shi (Academia Sinica, Peking) *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 403-436 refs (For primary document see N85-29869 18-92)
(Grants NAGw-255; NGL-05-002-034; NSF ATM-82-11002)
Avail: NTIS HC A21/MF A01 CSCL 03B

New studies of the quiet Sun reveal that ephemeral active regions constitute minority rather than a majority of all the short lived, small scale bipolar features on the Sun. In contrast to the recognized patterns of growth and decay of ephemeral regions, various examples of the creation of other temporary bipoles nicknamed pseudo ephemeral regions are illustrated. The pseudo ephemeral regions are the consequence of combinations of small scale dynamic processes of the quiet Sun including: (1) fragmentation of network magnetic fields, (2) the separation of opposite polarity halves of ephemeral regions as they grow and evolve, and (3) the coalescence of weak network or intranetwork magnetic fields. New observations offer the possibility of resolving the discrepancies that have arisen in the association of ephemeral regions with X-ray bright points. Many X-ray bright points may be related to those pseudo ephemeral regions which have begun to exhibit magnetic flux loss. Author

N85-29902*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EVIDENCE FOR SUBMERGENCEW OF MAGNETIC FLUX IN A GROWING ACTIVE REGION
Douglas M. Rabin, R. L. Moore, and Mona J. Hagyard *In its* Meas. of Solar Vector Magnetic Fields May 1985 p 437 (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 03B

In NOAA Active Region 2372 (April 1980), 4 x 10 to the 20th power maxwell of magnetic flux concentrated within a 30' circular area disappeared overnight. Vector magnetograms show that all components of the magnetic field weakened together. If the field had weakened through diffusion or fluid flow, 80% of the original flux would still have been detected by the magnetograph within a suitably enlarged area. In fact there was at least a threefold decrease in detected flux. Evidently, magnetic field was removed from the photosphere. Since the disappearing flux was located in a region of low magnetic shear and low activity, it is unlikely that the field dissipated through reconnection. The most likely possibility is that flux submerged. Observations suggest that even in the growth phase of active regions, submergence is a strong process comparable in magnitude to emergence. Author

N85-29903*# Pennsylvania Univ., Philadelphia. Dept. of Radiation Therapy.
SOLAR PHYSICS APPLICATIONS OF COMPUTER GRAPHICS AND IMAGE PROCESSING **c60**
Martin D. Altschuler *In* NASA. Marshall Space Flight Center Meas. of Solar Vector Magnetic Fields May 1985 p 441-453 (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 09B

Computer graphics devices coupled with computers and carefully developed software provide new opportunities to achieve insight into the geometry and time evolution of scalar, vector, and tensor fields and to extract more information quickly and cheaply from the same image data. Two or more different fields which overlay in space can be calculated from the data (and the physics),

then displayed from any perspective, and compared visually. The maximum regions of one field can be compared with the gradients of another. Time changing fields can also be compared. Images can be added, subtracted, transformed, noise filtered, frequency filtered, contrast enhanced, color coded, enlarged, compressed, parameterized, and histogrammed, in whole or section by section. Today it is possible to process multiple digital images to reveal spatial and temporal correlations and cross correlations. Data from different observatories taken at different times can be processed, interpolated, and transformed to a common coordinate system.
Author

N85-29904*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GRAPHIC DISPLAYS OF VECTOR MAGNETOGRAPH DATA
c60
Douglas M. Rabin and E. A. West *In its* Meas. of Solar Vector Magnetic Fields May 1985 p 454-466 (For primary document see N85-29869 18-92)
Avail: NTIS HC A21/MF A01 CSCL 09B

Graphic displays that have proved useful in dealing with vector magnetograph data are summarized in three settings: real-time control, analysis, and final presentation. Among the topics discussed are: flexible, implicit data-scaling; geometrical transformations; methods of comparing fields (e.g., transverse vs. longitudinal; observed vs. computed; one time vs. another); displaying the magnitude and direction of the transverse field; minimizing the display time of serial graphics devices; graphic file structure; and graphic interaction with operators and observers.
Author

N85-29905*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
SHOCKS IN THE SOLAR WIND BETWEEN 1 AND 8.5 AU: VOYAGER 1 OBSERVATIONS
Paul R. Gazis [1984] 58 p refs Prepared for JPL
(Contract JPL-953733)
(NASA-CR-175911; NAS 1.26:175911; CSR-P-84-1) Avail: NTIS HC A04/MF A01 CSCL 03B

A survey was made of all interplanetary shocks detected by the plasma science experiment aboard the Voyager 1 spacecraft between 1.2 and 8.5 AU. Shock normals and shock velocities are determined. The variation of shock frequency and various shock parameters with heliocentric distance is discussed. The results indicate that beyond 1.2 AU, the vast majority of shocks were associated with interaction regions between high and low speed streams; of 95 events, only 1 was clearly associated with a transient event. Forward shocks were more numerous and seemed to form closer to the sun than reverse shocks. Forward shocks were stronger than reverse shocks. The energy balance of three shocks is examined. A close agreement is found between the measured and the predicted pressure ratios across these shocks. The contribution of shocks to the global energy balance is discussed. Shocks are found to have a significant effect in heating the solar wind.
B.W.

N85-29906*# Colorado Univ., Boulder. Dept. of Astrophysical, Planetary and Atmospheric Sciences.
TURBULENCE AND WAVE PARTICLE INTERACTIONS IN SOLAR-TERRESTRIAL PLASMAS Annual Status Report, 1 Jul. 1983 - 30 Jun. 1984
George A. Dulk, Martin V. Goldman, and Juri Toomre 1985 28 p
(Grant NAGw-91)
(NASA-CR-175970; NAS 1.26:175970) Avail: NTIS HC A03/MF A01 CSCL 03B

Activities in the following study areas are reported: (1) particle and wave processes in solar flares; (2) solar convection zone turbulence; and (3) solar radiation emission. To investigate the amplification of cyclotron maser radiation in solar flares, a radio frequency. (RF) heating model was developed for the corona surrounding the energy release site. Then nonlinear simulations of compressible convection display prominent penetration by plumes into regions of stable stratification at the base of the solar convection zone, leading to the excitation of internal gravity waves there. Lastly, linear saturation of electron-beam-driven Langmuir waves by ambient density fluctuations, nonlinear saturation by strong turbulence processes, and radiation emission mechanisms are examined. An additional section discusses solar magnetic fields and hydromagnetic waves in inhomogeneous media, and the effect of magnetic fields on stellar oscillation.
F.M.R.

N85-29907*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
THE INFLUENCE OF THE HELIOSPHERIC CURRENT SHEET AND ANGULAR SEPARATION ON FLARE ACCELERATED SOLAR WIND
Harald M. Henning, Philip H. Scherrer, and J. Todd Hoeksema Apr. 1985 17 p refs Submitted for publication Sponsored in part by NSF and ONR
(Grant NGR-05-020-5590; Contract N00014-76-C-0207; Grant NSF ATM-77-20580)
(NASA-CR-175962; NAS 1.26:175962; SU-CSSA-ASTRO-85-17)
Avail: NTIS HC A02/MF A01 CSCL 03B

A complete set of major flares was used to investigate the effect of the heliospheric current sheet on the magnitude of the flare associated disturbance measured at Earth. It was also found that the angular separation tended to result in a smaller disturbance. Thirdly, it was determined that flares tend to occur near the heliospheric current sheet.
Author

N85-29908# Rome Univ. (Italy). Dipt. di Fisica.
THE POSSIBILITY OF OBSERVING SOLAR NEUTRON EVENTS IN THE LOWER ATMOSPHERE
N. Iucci, M. Parisi, C. Signorini, M. Storini, G. Villoresi, and N.L. Zangrilli 16 Nov. 1984 9 p refs Presented at Intern. Symp. on Cosmic Ray Modulation in the Heliosphere, Morioka, Japan, 21-25 Aug. 1984
(NOTA-INTERNA-837) Avail: NTIS HC A02/MF A01

Neutron monitor data on 8 solar flares accompanied by gamma-rays and 10 solar flares accompanied by large X-ray (25 to 500 keV) fluxes were analyzed. Results show that the solar energetic neutron events can be detected by ground-based stations particularly when they are located at mountain altitudes and low latitudes. Suggestions for improving the neutron monitor efficiency for detecting solar neutron events are given.
Author (ESA)

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N85-29909*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY MODULATION AND TURBULENT INTERACTION REGIONS NEAR 11 AU
L. F. Burlaga, F. B. McDonald (NASA, Washington, D.C.), M. L. Goldstein, and A. J. Lazarus (MIT, Cambridge) Feb. 1985 42 p refs Submitted for publication
(NASA-TM-86193; NAS 1.15:86193) Avail: NTIS HC A03/MF A01 CSCL 03B

When Voyager 2 was near 11 AU, the counting rate of nuclei approx > 75 MeV/nucleon decreased during the interval from July, 1982 to November, 1982, and it increased thereafter until August, 1983. A decrease in cosmic ray flux was generally associated with the passage of an interaction region in which the magnetic field strength B was higher than that predicted by the spiral field model, B sub p. Several large enhancements in B/B sup p were associated with merged interaction regions which probably resulted from the interaction of two or more distinct flows.

During the passage of interaction regions the cosmic ray intensity decreased at a rate proportional to (B/B sup p -1), and during the passage of rarefaction regions (where B/B sup p < 1) the cosmic ray intensity increased at a constant rate. The general form of the cosmic ray intensity profile during this approx 13 month minicycle can be described by integrating these relations using the observed B(t). Latitudinal variations of the interaction regions and of the short-term cosmic ray variations were identified. B.W.

99 GENERAL

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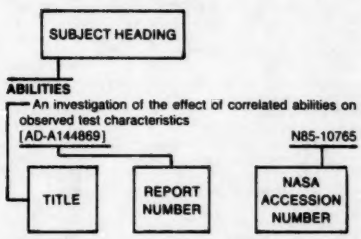

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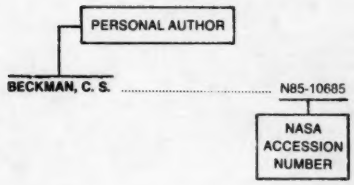

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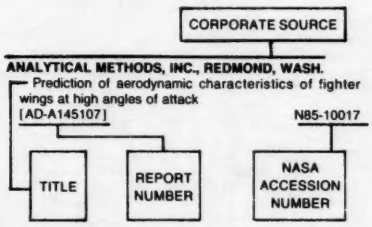

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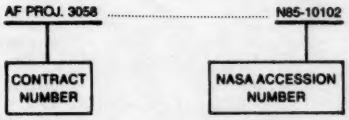

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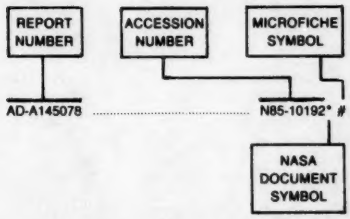

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